Addendum No. 3
to the Bidding Documents

Cloth Media Filtration System Procurement
Town of Spencer, MA

Issued: June 22nd, 2021

Under the provisions of Article 7 of Section 00200, Instructions to Bidders, Bidders are informed that the Bidding Documents for the above-mentioned Project are modified, corrected, and/or supplemented as follows. Addendum No. 3 becomes part of the Bidding Documents and Contract Documents.

Acknowledge receipt of this addendum by inserting its number on Page 15, Section 6 Price Proposal Form, of the Request for Proposals. Failure to acknowledge receipt of the Addendum may subject the Bidder to disqualification.

Project Manual Changes

Item 3-1 Request for Proposals – Section 5

Insert the following rows after Row 4.c. to the table in Section 5.1:

Item Number	Item Name / Description	Units	Value
5.	Required **chemical for Copper Removal.** List recommended chemical, recommended supplier, product number, and aging time. Provide quote from Chemical Supplier of $/gallon for delivery of a 30-day minimum supply to the point of destination.	N/A	Not required for Bid. Chemical shall be established by successful Bidder during Validation Testing.
5.a.	Average dosage of **chemical for Copper Removal** required under specified Conditions at Design Average Flow (1.08 MGD)	ppmvp	Not required for Bid. Guaranteed Value shall be established by successful Bidder during Validation Testing.

Item 3-2 Section 11365 - Cloth Media Filtration System

Delete Section 11365 in its entirety and replace it with the revised version attached to this Addendum. All changes to Section 11365 are shown in track changes. This includes changes per Addendum 1 (as noted in the revised section) as well as changes to the following paragraphs (also noted in the revised section): 1.1.A, 1.1.D, 1.3.

Item 3-3 Section 11365 - Cloth Media Filtration System

Insert Attachment C provided with this Addendum following Attachment B of Section 11365.

END OF ADDENDUM NO. 3

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SECTION 11365

CLOTH MEDIA FILTRATION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Cloth media filtration system

2. Attachment A - Spencer, MA WWTP Operating Data from January 1, 2018 to August 31, 2020

3. Attachment B - Supplemental Phosphorus Data, March 2021

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~~3.~~4. Attachment C – Total Copper Sample Results

B. Related Sections

1. Section 01300 – Submittals

2. Section 11000 – Equipment – General

C. General System Description

1. The Cloth Media Filtration System shall remove phosphorus from the treated water at the Spencer MA Wastewater Treatment Plant (WWTP). The system will be installed in a new building on concrete slab floors complete with rapid mix and flocculation tanks (a.k.a. reaction tanks) and chemical feed systems, all of which will be constructed by the Buyer (the successful Construction Contractor) in accordance with recommendations (design and layout) provided by the Seller, who shall be a qualified manufacturer serving as the equipment supplier for this Project.

2. This Section includes the furnishing of all Goods and Special Services required whether specifically mentioned in this Section or not, as required for a complete operational System and as needed to assist in installation, commissioning, and performance testing, to provide a complete System ready for operation.

3. This Section gives a general description of what is required but does not purport to cover all details, as these will vary in accordance with the design requirements of specific equipment.

4. The Cloth Media Filtration System shall include rapid mixers, flocculation mixers, and Cloth Media Filters with control panels. The Cloth Media Filters will be installed as shop fabricated stainless steel tanks. The Cloth Media Filtration System shall also include provisions for facilitating chemical cleaning of the System.

5. The Seller shall be responsible for providing design guidance and approval of the design of the related system components provided by others including sizing (dimensions) of rapid mix and flocculation tanks, maintenance access platforms, and chemical feed systems with respect to capacities and control schemes of chemical dosing pumps. The Seller is not responsible for design details of

equipment supplied by others, including, but not limited to, materials of construction, wall thicknesses.

6. Rapid mix and flocculation tanks are to be provided by others but designed in accordance with the Seller's recommendations. Tanks shall be located outdoors. Each tank will be fitted with a Seller provided top mounted VFD driven mixer suitable for outdoor installation. These tanks will allow for the conversion of soluble phosphorus into particulate phosphorus and the agglomeration of particles into floc suitable for removal in the Cloth Media Filtration System.

7. Following the flocculation tanks, wastewater will flow by gravity to the cloth media filters for removal of phosphorus floc. Solids from the filters are to be backwashed and pumped to the splitter box upstream of the secondary clarifiers.

8. The Cloth Media Filters shall be fully automated with one Cloth Media Filter Control Panel (CMFCP) per filter furnished and pre-programmed prior to delivery to the site.

9. Special Services shall include pre-commissioning, commissioning, startup, training, performance testing, and coordination with the Buyer, the Owner, and the Plant Control System Supplier/Integrator (PCSS) during construction for proper interface of the CMFCP with the plant's Supervisory Control and Data Acquisition (SCADA) system.

10. The Cloth Media Filtration System shall remove phosphorus and solids from the plant's effluent wastewater (prior to disinfection) and produce effluent that complies with the Performance Requirements in Paragraph 1.4 as demonstrated through Process Performance Testing specified in Paragraph 3.4. The Seller's system shall be backed by a Performance Guarantee as required in Paragraph 1.5 and Performance Bond in Paragraph 1.11.

D. Summary of Existing Treatment Plant Processes and Permit

1. The existing wastewater treatment plant utilizes a combination of processes to treat the plant influent. The main wastewater processes following the completion of upgrades will include fine screening, vortex grit removal, conventional activated sludge (extended aeration with high solids residence times and hydraulic detention times) with diffused air aeration tanks and secondary clarifiers, and UV disinfection. Existing constructed wetlands for nutrient removal located downstream of UV disinfection will be abandoned. The existing plant currently removes phosphorus by adding alum to the secondary process and in the constructed wetlands.

2. A summary of the WWTP's operating data from January 1, 2018 to August 31, 2020 is included as Attachment A of this Section for information purposes only. The data is based on the current operational strategy which attempts to target an effluent Total Phosphorus concentration of <0.5 mg/L through chemical addition upstream of the secondary clarifiers and the use of constructed wetlands. Following the upgrades, the constructed wetlands will be abandoned and chemical addition will attempt to target a secondary effluent Total Phosphorus concentration of <1.0 mg/L. **Therefore, the plant operating data will change following the upgrades.**

3. The System (reaction tanks and cloth media filters) will be added to the existing plant downstream of the secondary clarifiers and upstream of UV disinfection. A

new flow meter will be provided by the Buyer at the UV system effluent for tertiary chemical flow pacing control. It should be noted that based on the final plant design, that a plant water system may be drawing water after the UV system and prior to the effluent flow meter which will require control logic to add the plant water flow meter and effluent flow meter flows along with any backwash flows that may be occurring (if flow is metered in real time) to get the influent flowrate to the System (reaction tanks and cloth media filters).

4. The project will incorporate TR-16 resiliency requirements which most notably require providing uninterrupted treatment at peak hour flow up to a 100-year flood elevation, and protecting equipment from damage due to flooding based on a 100 year flood plus 3 feet while passing peak hour flow through the WWTP.

5. The System will be used to comply with the plant's NPDES permit (No. MA0100919), which currently includes Total Phosphorus mass-based average monthly limits, as well as less stringent average monthly Total Phosphorus concentration limits, as listed below. (Current flows below are based on daily flow data from January 2018 through August 2020.)

   a. Summer from April 1 to October 31:

      1) Seven-month average mass-based limit = 0.79 lbs/day

      2) This is equivalent to 0.088 mg/L on average at the Permitted Annual Average capacity of 1.08 MGD.

   b. Winter from November 1 to March 31:

      1) Five-month average mass-based limit = 1.19 lbs/day

      2) This is equivalent to 0.13 mg/L on average at the Permitted Annual Average capacity of 1.08 MGD.

   c. The seasonal mass total phosphorus loads are to be calculated as the arithmetic mean of the seven monthly average total phosphorus loads for the months of April through October, and as the arithmetic mean of the five monthly average total phosphorus load for the months of November through March.

   d. In addition to the mass-based limits, the Spencer WWTP must also meet average monthly total phosphorus concentration limits of 0.1 mg/L in Summer and 0.2 mg/L in Winter.

   e. The Permit also limits effluent pH to between 6.5 and 8.3 Standard units.

6. Refer to Paragraph 1.4 for the Performance Requirements that the System must meet.

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7. The plant's NPDES permit also includes the following limits for Total Copper:

   a. Average Monthly of 10.3 µg/L

   ~~.~~b. Maximum Daily of 15.3 µg/L

1.2 PRESELECTION OF EQUIPMENT

A. The Buyer intends to pre-select the equipment and services specified in this section (Goods and Special Services) for the Spencer Wastewater Treatment Plant (WWTP).

The Goods and Special Services specified herein shall be purchased by the Contractor/Assignee (the successful Construction Contractor) from the successful Bidder at the prices bid on the Price Proposal Form or as otherwise allowed in these Contract Documents.

B. All requirements described herein are considered minimum requirements and must be met in order for a bidder to be deemed responsive. The Buyer reserves the right to request additional information, if required to make this determination, to show that the requirements herein have been met.

C. The Goods and Special Services specified in this section shall be furnished by one Seller (a qualified manufacturer who will serve as the equipment supplier for this Project). All components of the system specified in this section shall be designed, furnished, tested, and started up by the Seller.

D. The following is a summary of the preselection requirements for the Seller of the equipment specified in this Section. If the following language is in conflict with language elsewhere in these documents, then the more restrictive and/or comprehensive requirements apply.

1. Bidders shall provide the information requested on the Price Proposal Form including, but not limited to, performance guarantees so that the Buyer can evaluate the Bidder's qualifications and equipment proposal in accordance with the Instruction to Bidders (Section 00200) to select the successful Bidder.

2. During the preselection process, the Buyer will evaluate the bids from Bidders in accordance with the criteria specified in the Instructions to Bidders (Section 00200). This includes a monetary evaluation (Price Proposal) to determine the present worth of the proposed System by evaluating capital and operational and maintenance costs, as well as a non-monetary evaluation of factors.

3. The successful Bidder, upon receipt of notification of selection from the Buyer, shall then submit Bidder Validation Testing protocols for approval by the Engineer and then complete Bidder Validation Testing as specified in this Section and in accordance with the Schedule provided in the Agreement (Section 00520). The Bidder Validation Testing shall be performed as specified in this Section and shall validate the Performance Requirements specified in this Section as well as the Bidder's Operation and Maintenance Guarantees as specified in the bid.

4. Provide "Preliminary Submittals" in accordance with the Schedule provided in the Agreement (Section 00520).

    a. Preliminary submittals shall supplement (and if approved by Engineer, replace) information provided with the bid and together with the bid submission provide sufficient detail to allow the Engineer to design the project and produce final design documents suitable for public bidding by construction contractors.

    b. This includes recommended rapid mix and flocculation tank dimensions, dimensions of all equipment furnished under this Section, constraints for locating equipment including backwash pumps, piping connections, and criteria for sizing coagulant and other chemical feed pumps (with respect to capacities and control schemes of chemical dosing pumps). Preliminary submittals shall delineate equipment that is factory installed by the Seller

vs. equipment that requires field installation by the Buyer including, but not limited to, mechanical equipment, electrical and controls equipment including wiring as well as which equipment requires anchoring and support in the field by the Buyer vs. which equipment is anchored and supported by factory supplied equipment from the Seller.

c. Provide Engineer assistance in developing final design documents and drawings. This will include preliminary submissions of all major equipment components that are sufficient in detail to design the layout and coordinate all equipment interfaces. Some of the information identified in Paragraph 1.6 may be required. This coordination shall continue until treatment plant design has been completed. Such coordination may include review of Engineer's draft drawings and specifications to confirm that they are consistent with the Bidder's design intent including items such as tank sizing and arrangement, process flow configurations, P&IDs, equipment locations, reviewing and approving specifications for equipment provided by others including, but not limited to, coagulant feed pumps, pH adjustment chemical feed pumps, and related piping systems.

d. Prior to Buyer finalizing the construction contract bid documents, Bidder shall review the chemical feed system designs in the construction contract and submit signed certifications that the proposed chemical feed systems in the construction contract are fully acceptable and will in no way void the Performance Guarantee requirements of this Section.

e. Bidder's review and certification of chemical feed system designs is with respect to capacity and control schemes of chemical dosing pumps. The Seller is not responsible for design details of equipment supplied by others, including, but not limited to, materials of construction and wall thicknesses

5. During the design phase, the Bidder may be required to make additional submittals, revise specific components, and work on issues of equipment compatibility with other suppliers. Facility drawings, equipment data sheets, process descriptions and other information are required to assure that the related equipment and facilities are coordinated and suitable for the equipment offered by the Bidder.

6. Notice of selection to the Bidder and execution of an Agreement with the Buyer to be considered in the design does not constitute the release of the Bidder's Bid Bond. The Seller's Bid Bond shall only be released when the Bidder executes an agreement with the Buyer (the Successful Construction Contractor)

1.3 BIDDER VALIDATION TESTING

A. Submit a protocol for Bidder Validation Testing for review by the Buyer and Engineer. Following review and upon approval, mobilize onsite and commence a minimum 14 business day bidder testing program operating a trailer mounted demonstration scaled down system. The pilot system shall operate at equivalent hydraulic retention times and surface loading rates proposed in the bid. The pilot system shall demonstrate the ability of the System to meet all the performance guarantee requirements and shall collect operating data for optimization of the System design.

B. The testing shall quantify the water quality of the filter effluent. For each day of testing for phosphorus removal at a specific coagulant dosage rate and for each day of testing

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for copper removal at a specific chemical dosage rate, a composite of the effluent sample shall be analyzed by an independent third party laboratory that is MassDEP state certified, acceptable to the Buyer, for Phosphorus (total with a minimum detection limit of 0.01 mg/L), Aluminum (total with a minimum detection limit of 0.050 mg/L), and Iron (total with a minimum detection limit of 0.040 mg/L) when testing for phosphorus removal, and shall be analyzed for Copper (total with a minimum detection limit of 3 µg/L) when testing for copper removal. For 15% of the phosphorus effluent samples, also collect soluble total and ortho-phosphorus. Additionally, for each day of testing for phosphorus removal, collect and analyze one influent composite sample for total phosphorus, iron, and aluminum~~.~~, and for each day of testing for copper removal, collect and analyze one influent composite sample for total copper. The Bidder's protocol must indicate if phosphorus removal and copper removal will be accomplished on separate testing days or concurrently.

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C. During the testing for phosphorus removal, allow for a minimum of two days testing per coagulant (testing four dosage rates per coagulant during that time) for three~~wo~~ coagulants, two days of polymer testing, and two days for stress testing at high flows and solids loads. During the testing for copper removal, allow for a minimum of two days testing per chemical (testing four dosage rates per chemical during that time) for up to two chemicals. Provide pH adjustment as necessary to maintain required plant effluent limits.

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D. During the Pilot Validation test, the Buyer will not be able to provide wastewater for the pilot that meets total phosphorus less than or equal to 1.0 mg/L as specified in Paragraph 1.4.C. To address this limitation, provide a pretreatment system capable of pre-treating just the flow required for validation testing with chemical addition and solids removal as required to achieve the system influent concentration in the range of 0.8 to 1.0 mg/L total phosphorus.

E. During Bidder Validation Testing, reasonable volumes of coagulants for phosphorus removal, effluent flushing water, and electrical power will be made available and provided by the Buyer. The Seller must recommend chemical or chemicals to be used for copper removal and must provide reasonable volumes of chemical for testing. The Buyer will also provide a location for the Seller to obtain the electrical power and effluent flushing water. However, the Seller will be responsible for providing the necessary temporary wiring and piping.

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F. The Seller will be responsible for collecting samples, sending samples to a third party laboratory and paying for analytical costs.

G. Submit to the Engineer and Buyer within 30 days of completion of testing a report summarizing the results of the Bidder's testing program and clearly stating that the Seller can (or cannot) meet the performance guarantees provided in the bid and specifications, and clearly describing the capacity of the System for phosphorus and copper removal using the chemicals tested at the specific dosage rates.

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H. If the Bidder is able to successfully demonstrate the ability of the System to meet the Performance Requirements specified in this Section as well as the Bidder's Operation and Maintenance Guarantees as specified in the bid, the Seller shall be eligible for compensation for the cost of Bidder Validation Testing expenses as outlined in the Agreement (Section 00520) and Article 13 of the General Conditions (Section 00700) and Supplementary Conditions (Section 00800), and the Bidder will be the named supplier in the Construction Contract for the equipment.

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I. If ~~the Bidder fails to successfully demonstrate the ability to meet the Performance Requirements specified in this Section as well as the Bidder's Operation and Maintenance Guarantees as specified in the bid for any single item, then the Bidder will be assessed a penalty and may or may not be terminated as outlined in the Instruction to Bidders (Section 00200) and Agreement (Section 00520). If the Bidder is not terminated, then they will be allowed to revise their Operation and Maintenance performance guarantee~~the Bidder fails to successfully demonstrate the ability to meet the Performance Requirements specified in this Section as well as the Bidder's Operation and Maintenance Guarantees as specified in the bid for any single item, then the Owner may choose to: 1) terminate the agreement as outlined in the Instruction to Bidders (Section 00200) and Agreement (Section 00520) and proceed with awarding to the next eligible bidder and the Bidder shall not be eligible for compensation for the cost of Bidder Validation Testing expenses as outlined in the Agreement (Section 00520) and Article 13 of the General Conditions (Section 00700) and Supplementary Conditions (Section 00800); or, 2) if the Bidder is not terminated, then they will be allowed to revise their Operation and Maintenance performance guarantee. ~~.~~

J. The Buyer reserves the right to waive the requirement for Bidder Validation Testing. Waiving the Bidder Validation Testing does not in any way waive or modify any other provisions of these Specifications, including but not limited to the performance guarantee and operation and maintenance guarantee. If the Buyer waives the Bidder Validation Testing, then the bid price for Bidder Validation Testing will not be paid.

1.4 PERFORMANCE REQUIREMENTS

A. Design the System based on one train of reactions tanks (rapid mix and flocculation tanks) followed by two disc filter trains. The train of reactions tanks must be sized for 100% of the Peak Hourly Flow Rate. Each disc filter train must be sized for 100% of the Peak Hourly Flow Rate (1 duty and 1 standby).

B. Design the System for the following design flow rates. Design flow rates are based on the WWTP forward flow design criteria. This means that the stated flow rates are equal to the treated filter effluent flow rates and that the influent to the filters will be at a higher flow rate that includes the effect of the recycle/backwash flows from the online filters. (Current flows are based on daily flow data from January 2018 through August 2020.)

1. Design Average Daily Flow Rate (Permitted Flow): 1.08 MGD
2. Design Peak Hourly Flow Rate: 6.1 MGD
3. Current Minimum Hourly Flow Rate – 0.1 Million gallons per day (MGD)
4. Current Average Daily Flow Rate: 1.02 MGD
5. Current Summer (April 1 – October 31) Average Daily Flow Rate: 0.89 MGD
6. Current Winter (November 1 – March 31) Average Daily Flow Rate: 1.22 MGD
7. Current Maximum Month Flow Rate: 1.60 MGD
8. Current Summer (April 1 – October 31) Max Month Flow Rate: 1.60 MGD
9. Current Winter (November 1 – March 31) Max Month Flow Rate: 1.90 MGD
10. Current Maximum Day Flow Rate: 3.4 MGD

C. Following construction of the WWTP upgrades and during the required filter Performance Testing, the plant will be operated in a manner such that characteristics of the System influent (prior to coagulant addition and resulting additional TSS load) will comply with the following limits:

1. Equivalent Peak Hour Flow Rate: 6.1 MGD (1 train in operation) plus the filter backwash flow rate under continuous backwash conditions not to exceed 5% of forward flow.

2. Equivalent Maximum Day Flow Rate: 3.4 MGD (1 train in operation) plus the filter backwash flow rate under continuous backwash conditions not to exceed 5% of forward flow.

3. Equivalent Permitted Annual Average Flow Rate: 1.08 MGD (1 train in operation) plus the filter backwash flow rate under continuous backwash conditions not to exceed 5% of forward flow.

4. Maximum 24-hour composite TSS Concentration: ≤ 30 mg/L

5. Average 24-hour composite TSS Concentration: ≤ 20 mg/L

6. Total Phosphorus Concentration: ≤1 mg/L (except as noted in Section 3.4)

Note that the above equivalent flow rates will be achieved during the Performance Test by operating the minimum number of duty filters required to test the equivalent loading rate while, if necessary, blinding off (or removing) disc filters to simulate the equivalent hydraulic and solids loading rates to the disc filters. See requirements below and in Paragraph 3.4 of this Section for testing requirements.

D. Effluent Performance Requirements: Provided that the influent to the System meets the above specified criteria and that the chemical dosing equipment provided by Buyer performs in accordance with the Seller's recommendations, the Seller shall guarantee that the System can treat the water to produce water with the following specified effluent water quality. Based on these requirements, the system will need to meet the strictest of the permit requirements plus a safety factor (which also includes growth for future flows):

1. "Long Term" Average Total Phosphorus During the Performance Test: ≤ 0.088 mg/L

   a. This requirement will be met if the average of all 24-hour composite samples collected during Routine Testing as described in 3.4-D.3 is below the specified limit, and if the average of all grab samples collected during Routine Testing is below the specified limit.

2. Maximum Instantaneous Total Phosphorus Sample During the Performance Test: ≤ 0.15 mg/L

   a. This requirement will be met if all samples collected during Routine Testing and Stress Testing as described in 3.4-D.3 are below the specified limit.

E. If the soluble non-reactive phosphorus concentration (defined as soluble total phosphorus minus soluble orthophosphate-phosphorus, as measured in the system effluent) is greater than 0.02 mg/L, then the "Long Term" average effluent total phosphorus concentration will be allowed to exceed the applicable limit specified above

by the same amount. For example, if the soluble non-reactive phosphorus concentration is 0.03 mg/L, then the "Long Term" average effluent total phosphorus concentration shall not exceed 0.088 + (0.03 - 0.02) = 0.098 mg/L during performance testing.

1.5 SELLER'S PROCESS PERFORMANCE GUARANTEE

A. The Seller shall provide a Process Performance Guarantee. The Process Performance Guarantee shall be considered satisfied if the Performance Test specified in Paragraph 3.4 of this Section is successful.

B. Should the System fail to meet the Performance Requirements during the Process Performance Test, then the Process Performance Guarantee shall require that the Seller comply with the following:

1. If the Performance Requirements in Paragraph 1.4 are not met, the Seller shall immediately, upon notice from the Engineer, make changes to the equipment such that process performance as guaranteed is obtained at no additional cost. Such changes may include, but not necessarily be limited to, modification of chemical dosages, adjustment of the backwashing system, chemical cleaning of filter media, providing additional instrumentation, instrumentation and control adjustments, replacing the media with different media, or other actions that may be deemed necessary.

2. If, after the necessary corrective measures are implemented, the System cannot pass the Intensive Effluent Quality Testing as described in Paragraph 3.4 after three attempts, the Seller shall remove the System and replace it with one that will meet the performance requirements at no additional cost.

3. If the System can pass the Intensive Effluent Quality Testing but cannot demonstrate through the Operation & Maintenance Guarantee Testing that they have achieved the Seller's guaranteed Operations and Maintenance criteria, the Seller shall pay an O&M Performance Penalty. The amount of the O&M Performance Penalty shall be equal to the present worth value over a twenty-year period of the calculated difference between the costs calculated by the Engineer for operation and maintenance (which are based on the guaranteed O&M values as discussed in the Cloth Media Filtration System Information Form) and the actual costs (measured during the Operation & Maintenance Guarantee Testing performance tests). The calculations will be performed in the same manner as O&M annual cost calculations used in the bid evaluation to select the Seller during pre-procurement with the exception that the coagulant used for the performance test will be weighted 100%. If during performance testing the Buyer provides a second coagulant for the purpose of testing, then the coagulants will be weighted 50% each for the purpose of calculating the O&M Performance Penalty. See the Instructions to Bidders (Section 00200). This means that the O&M Performance Penalty will not be assessed unless the total (considering in aggregate, the usage of polymer and coagulant chemicals) present worth costs change.

4. If the difference between the actual and guaranteed <u>annual</u> operation and maintenance costs (based on the Seller's guarantee values and Actual value) are less than 20%, then no O&M Performance Penalty will be assessed.

C. The maximum value of the penalties assessed under this guarantee shall be in accordance with the limits specified in the Agreement (Section 00520 Article 11).

1.6 SUBMITTALS DURING CONSTRUCTION

A. General

1. Provide submittals in accordance with Section 01330.

2. Coordinate submittals with the Buyer and deliver when directed by the Buyer, unless indicated otherwise below.

3. Provide submittals in a timely manner to ensure approval, fabrication and delivery of all equipment and appurtenances as required by the Construction Contractor schedule requirements.

4. Should the submittal include any items not in compliance with these specifications and/or the Drawings, provide a full description of the non-complying aspects.

5. If it is impossible to conform to certain details of the specifications due to different manufacturing techniques, describe completely all non-conforming aspects.

B. Seller Certifications

1. Seller shall review the chemical feed system designs in the construction contract and submit signed certifications that the proposed chemical feed systems in the construction contract are fully acceptable and will in no way void the Performance Guarantee requirements of this Section.

2. Bidder's review and certification of chemical feed system designs is with respect to capacity and control schemes of chemical dosing pumps. The Seller is not responsible for design details of equipment supplied by others, including, but not limited to, materials of construction and wall thicknesses.

Add. #1

C. As specified in Section 01330, submit certifications ~~for all applicable iron or steel products indicating that all manufacturing processes occurred in the United States~~that demonstrate compliance with the American Iron and Steel Requirements.

D. Shop Drawings

1. Process Flow Diagram - Provide a one-sheet diagram that illustrates the wastewater flow through the System process. This diagram shall include a table of design criteria.

2. Piping and Instrumentation Diagram - Provide a Piping and Instrumentation Diagram that illustrates the interconnecting piping, valves, instruments and equipment associated with the phosphorus removal system treatment process.

3. Installation Drawings - Provide installation drawings for equipment and piping assemblies, including reaction tanks, mixers, and pumps. These drawings shall illustrate equipment dimensions, nozzle locations and sizes, loads, foundation and anchor bolt plans, anchor bolt sizing, materials of construction, and critical clearance requirements.

4. A complete Bill of Materials (BOM) listing all equipment being supplied shall be provided.

5. All shop drawings submitted by the Seller shall be updated to reflect as-built conditions based on modifications, if any, that have been made to the System by the Seller at installation and startup.

6. See control and electrical system submittals below for additional shop drawing requirements.

E. Product Data

1. Hydraulic Data - Provide water elevations and hydraulic loading rates under design average daily flow and peak hourly flow conditions specified in Paragraph 1.4.B for the Cloth Media Filtration system at each zone including influent chamber, filter chamber, and effluent chamber. Provide all weir elevations. Provide water elevation above overflow weir assuming 100% of peak hourly flow is overflowing. This data may be submitted in a graphical or tabular form.

2. Operations and Maintenance requirements – Provide list of routine maintenance requirements; necessary maintenance equipment; special tools required for checking, testing, parts replacement, and maintenance; special handling instructions; and storage and protection requirements prior to installation for all equipment provided as part of the System by the Seller.

3. Material and Equipment List - Provide a complete list of equipment and materials (with ASTM UL/CSA, IEC designations, etc.), including manufacturer's descriptive data and technical literature, performance charts and curves, catalog cuts, utility requirements, paint system, including coating materials, surface preparation, and workmanship, and installation manuals for all components, including, but not limited to the following:

   a. Cloth Media Filters

      1) Submit general arrangement drawings of filters depicting dimensions, materials of construction, lifting points, ancillary equipment mounting configurations, and finishes.

      2) Weight of each complete filter. These weights shall be verified by the Contractor with substantiating copy to the Engineer as the material is received on the job site.

   b. Filter Backwash Pumps

   c. Backwash Recycle Pumps (if applicable)

   d. Filter Drive Mechanisms

   e. Filter Covers (if applicable)

   f. Rapid Mix and Flocculation Mixers

   g. Cleaning System Components (Automatic Skid Mounted System if applicable)

   h. Hydrochloric Acid Drum Chemical Transfer Pump (if applicable)

   i. Weir Assemblies

   j. Field Instruments

1) Complete equipment specifications, manufacturer recommended details of connections, wiring, range and dimensions. Submittals consisting of only general sales literature will not be acceptable.

2) Submit detailed information for each instrument or control device, including manufacturer's descriptive literature and a specific data sheet for each device which shall include (a) product (item) name used herein and Tag number as shown on the Contract Drawings, (b) manufacturers complete model number, (c) location of the device, input - output characteristics, (d) range, size, and graduations, (e) physical size with dimensions, enclosure NEMA classification and mounting details, and (f) materials of construction of all components.

3) Manufacturer's data regarding operational range, intended service condition, installation requirements, materials of construction, and maintenance procedures for all instruments.

4. See control and electrical system submittals below for additional product data requirements.

F. Structural Design Calculations

1. If the filter is provided in a stainless steel tank, submit structural calculations for the steel tanks stamped and signed by a Professional Engineer licensed in the Commonwealth of Massachusetts, in accordance with Section 11000. Clearly indicate all loads acting on the structure, the basis of design for the structure, and how the structure complies with the current Massachusetts Building Code.

2. The structural calculations shall also demonstrate that the anchoring of the System components is adequate to restrain the System components from all applicable forces without damage to the equipment/materials and basins. Applicable forces for designing the System components and anchoring systems shall be in accordance with the Massachusetts Building Code including but not limited to gravity, seismic, water sloshing, and wind forces. The design shall withstand all loads in submerged and non-submerged conditions. The Seller shall provide mounting and supporting details in compliance with the Massachusetts Building Code requirements including supports for the equipment.

3. Refer to Section 11000 for additional structural design data applicable to the project site location.

Add. #1

~~3.~~4. According to ASCE 7-10, "Mechanical and electrical components in Seismic Design Category B" are exempt from the seismic design requirements. Seismic review of the supports and Attachment (anchorage) of the disc filter equipment is required.

G. Control and Electrical Systems Submittals

1. Control and electrical system submittals shall provide complete documentation of the proposed hardware, including but not limited to control panel hardware, circuit breakers, control panel layout, Programmable Logic Controllers (PLCs), input/output (I/O) modules, Operator Interface Terminals (OITs), computers if

required, communication equipment, cables, peripherals, etc.. A complete Bill of Materials (BOM) listing all hardware equipment shall be provided.

2. System Block Diagrams

   a. Complete schematic system block diagram(s) showing the interconnections between major hardware components.

   b. The block diagram(s) shall reflect the total integration of all control devices in the System and any OIT locations. Location of all components shall be clearly identified with appropriate cross-references.

   c. Diagrams shall reference all interconnecting cabling requirements for digital components of the System including any data communication links.

   d. Block diagram(s) shall reflect the integration of the Equipment Supplier's control system in the plant wide SCADA system. Location and division of responsibility shall be clearly identified.

3. Data Sheets

   a. A data sheet for all major hardware component listing all model numbers, options, and auxiliary and ancillary devices that are being provided.

      1) The data sheets shall be provided with an index, proper identification and cross referencing. They shall include, but not be limited to, the following information:

      2) Product (item) name used herein and on the Contract Drawings

      3) Supplier's complete model number

      4) Location of the device

      5) Input/output characteristics

      6) Range, size and graduations

      7) Physical size with dimensions, enclosure NEMA classification and mounting details

      8) Materials of construction of all components

      9) Power supply device sizing calculations, where applicable

4. System Input / Output

   a. Submit a complete Input / Output (I/O) list for devices connected to the control system under this Contract. The I/O list shall be submitted in a Microsoft Excel readable electronic file format and an 8-1/2-in by 11-in hard copy. The I/O list shall include, but not be limited to, the following information:

      1) Tag number(s)

      2) Description

      3) Physical location

      4) Physical point address

5) I/O type

6) Range and Engineering Units (for Analog I/O)

7) Where multiple mechanical components are provided for process redundancy, their field connections to I/O modules shall be arranged such that a failure of a single I/O module will not disable all mechanical components of the redundant system.

5. Control Panel Layout and Wiring Drawings

a. Panel Layout Drawings: Drawings shall be furnished for all panels, consoles, and equipment enclosures specified. Panel assembly and elevation drawings shall be drawn to scale and detail all equipment in or on the panel. Panel drawings shall be 8.5”x11” or 11"x17" in size. As a minimum, the panel drawings shall include the following:

1) Interior and exterior panel elevation drawings to scale.

2) Nameplate schedule.

3) Conduit access locations.

4) Panel construction details.

5) Cabinet assembly and layout drawings to scale. The assembly drawing shall include a bill of material on the drawing with each panel component clearly defined. The bill of material shall be cross-referenced to the assembly drawing so that a non-technical person can readily identify any component of the assembly by supplier and model number.

6) Fabrication and painting specifications including color (or color samples).

7) Heating and cooling calculations for each panel supplied indicating conformance with cooling requirements of the supplied equipment and environmental conditions. If cooling or heating equipment is provided, provide calculations to justify the sizing of the equipment.

8) Submit evidence that all control panels shall be constructed in conformance with UL 508 and bear the UL seal confirming the construction. Specify if UL compliance and seal application shall be accomplished at the fabrication location or by field inspection by UL inspectors.

9) Submit dimensional drawings of floor layout including location plans for control panel (to be established by the Engineer), wiring external to panel, work that requires dimensional coordination with other trades, conduit routing, working clearances, and operator controls.

b. Panel Wiring Diagrams: Panel wiring diagrams depicting wiring within and on the panel as well as all connections to external devices. Panel wiring diagrams shall include power and signal connections, UPS and normal power sources, all panel ancillary equipment, protective devices,

wiring and wire numbers, and terminal blocks and numbering. Field device wiring shall include the device ISA-tag and a unique numeric identifier. The diagrams shall identify all device terminal points that the system connects to, including terminal points where I/O wiring lands on equipment not supplied by the Seller. I/O wiring shall be numbered with rack number, slot number, and point number. Two-wire and four-wire equipment shall be clearly identified, and power sources noted. Submit final wire numbering scheme.

6. Control System Standards and Conventions Submittal

   a. Seller shall coordinate with the Plant Control System Supplier (PCSS) and provide a control system that is in accordance with the standards and conventions established by the PCSS for the WWTP's SCADA system The WWTP's existing data acquisition system will be upgraded and improved upon as part of the construction of the WWTP Upgrade project. The PCSS will be responsible for aligning standards and conventions proposed for use to upgrade the WWTP's SCADA system as agreed to by the Buyer. In addition to coordination required during shop drawings review, Seller shall allow for a minimum of three two-hour conference calls for coordination related to standards and conventions to be used and integration of the Seller's equipment with the WWTP's SCADA system. Note that the Plant Control System Supplier (PCSS) will be responsible for providing the plant's new control system hardware, software, and licensing (except for control panels furnished as part of a Seller's equipment package), and the PCSS will be responsible for programming the plant's new control system hardware and software (except for control panels furnished as part of a Seller's equipment package) and coordinating the tags and tag addressing for all equipment.

   b. This submittal shall include the standards and conventions used to organize, develop and provide a consistent control system with the plant's SCADA system. Standards shall be developed for the following as a minimum:

      1) Naming Conventions

      2) Operator interface, set point entry, equipment control, display navigation

      3) Graphic standards, colors, equipment symbols, etc.

      4) System security

      5) Alarming

7. Plant Network Topology

   a. Allocate space within panel for installation of an Ethernet switch to connect to the Plant Network. One port shall be dedicated to the Seller's PLC and connected with CAT6 Ethernet cable provided by Seller. Other ports shall be spares and available for Plant Control System Supplier's access to Plant Network.

   b. All Seller-supplied control panels requiring Ethernet connection beyond that of a PLC, OIT, Laptop Port, and Plant Network Connection shall be

on a Control Network which is separate from the Plant Network. Use of NAT (network address translation) or a 'converged' network is an exception to a separate network and must be reviewed and approved by Engineer. Exceptions will be granted on a case-by-case basis and require coordination of IP addresses and use of a managed switch. Managed switch shall match Plant Network switches provided elsewhere in this project.

8. Operator Interface

   a. Provide a printout with a screen shot of each proposed screen on the Operator Interface Display touch screen, with a description of the proposed functionality of each of the buttons and a description of the meaning of each output.

   b. This submittal shall cover the specific system control schemes as well as the details of the process graphic displays.

   c. The submittal shall contain the semifinal details of all logs, reports, and process graphic displays. The specifics of what shall appear on each display and what calculations are required to support them shall be developed and submitted.

   d. A complete listing of all signals to be collected for long term historical information shall be provided. This listing shall include frequency of data sampling and duration for which the data shall be immediately accessible.

   e. A complete listing of all signals to be collected for trend display shall be provided. This listing shall include frequency of data sampling and duration for which the data shall be immediately accessible.

9. Process Control Strategy

   a. Provide a process control narrative that describes the overall Cloth Media Filtration system sequence of control for normal, alternate (such as manual), and emergency operations, interlocks, data collection and recording, alarms, and set points.

   b. The process control schemes shall be developed in ladder logic diagram (unless alternative language is approved by Engineer) based on information from the Specifications. Included with each diagram shall be:

      1) Brief scope of the Control Function

      2) Listing of all scanned inputs to the control function

      3) A narrative of the control strategy

      4) Any assumptions made in developing the program

      5) I/O database listing showing all field inputs and outputs (i.e., AI, DI, AO, DO) associated with the control function.

      6) Cross reference list of all I/O showing to which I/O modules or software modules they are linked

7) Listing of all operator inputs/outputs to and from the control function. Any special displays related to the function shall be illustrated. A description of the operation of any panels shall be described as it relates to the control function.

8) Listing of alarms

9) Descriptions of how alarms will be handled and affect the process

c. This submittal shall cover all the associated logic required to implement the control functions specified.

d. Submit annotated PLC logic in 8.5”x11” format. In addition, each network or rung shall be annotated so that a person can read and easily comprehend what control function the rung or network is performing.

10. Coordination Submittals

a. Seller shall contact and coordinate with the PCSS to ensure compatible configuration of the Seller’s PLC(s) and related devices in order to match the Plant Network. Seller shall configure the Seller’s equipment network addresses, IP addresses, and Subnet mask in their equipment to match the addresses determined by the PCSS. Software communication shall be provided in contiguous registers.

H. Plans

1. Pre-Commissioning, Commissioning, Startup Testing, and Performance Testing Plans - Submit plans for Commissioning, Startup Testing and Demonstration, and Performance Testing at least 60 calendar days before initiating Commissioning. The Plans shall address all testing required in Part 3 of this Section. The plans shall also include the forms that will be used to record data in the field. The Plans shall include test schedules, sample locations, test procedures, and verification of laboratory certification.

2. Training Program - Submit for review a written training course curriculum and training instructions 30 days prior to the start of training.

I. Seller’s Representative

1. Provide the qualifications of the trained full-time employee of the Seller that will be at the project site as the Seller’s representative as required during the installation, commissioning, startup, training, and testing of the System.

J. Test Reports and Certificates

1. Factory test reports for all 3-phase motors 20 hp and larger. Test reports shall include:

a. No load current

b. Full load current

c. Breakdown torque

d. Locked rotor (starting) current

e. Locked rotor torque

f. Hi-potential test

2. Startup Testing - Provide written certification that the equipment is installed correctly and in accordance with the Seller's requirements.

3. Performance Testing - Provide a memorandum that summarizes the results of the Performance Testing. The results of any failed tests shall be included along with a description of the corrective actions taken.

4. Test reports including background data, calculations, operational plant data and other information showing the development of the proposed design and demonstrating that it will conform to all specified requirements.

K. Operation and Maintenance Data

1. Provide complete operation and maintenance manuals specifically for this installation that include instructions, procedures, and illustrations for both normal operating conditions and emergency conditions in accordance with Section 01770.

L. Closeout Submittals

1. Provide as-delivered drawings of major equipment upon completion of installation. Provide an electronic copy.

2. Provide special warranty information.

3. Provide closeout submittals in accordance with Section 01770.

M. Installation diagrams for the equipment furnished under this section. Control data including:

1. Motor data shall include function, horsepower, phase, frequency, voltage, approximate full load current, service factor, nominal RPM, frame size, NEMA speed torque design, and insulation class.

2. A control schematic diagram shall be provided, that shows power and control circuits in enough detail to evaluate the control system design.

1.7 REFERENCE STANDARDS

A. American Gear Manufacturers Association (AGMA)

B. American National Standards Institute (ANSI)

C. American Society for Testing and Materials (ASTM)

D. American Society of Mechanical Engineers (ASME)

E. Institute of Electrical and Electronics Engineers (IEEE)

F. Where reference is made to standards of one of the above, or other organizations, the version of the standard in effect at the time of the Bid Proposal opening shall apply.

1.8 WARRANTY

A. The Seller shall provide a warrantee on the Cloth Media Filtration System for 12 months from substantial completion to be free from defects in design, material, and workmanship.

B. Standard parts or products manufactured by others (e.g., pumps) and provided by the Seller shall be warranted to the extent of the manufacturer's original warranty which shall be no less than that specified above in 1.8.A.

C. During this warranty period, the Seller shall within 30 days of the receipt of a notice from the Buyer regarding defective components, material, or workmanship make good all defective material and workmanship without any additional cost to the Buyer. Buyer shall make a reasonable effort to make the defective Goods available to the Seller.

1.9 SPARE PARTS AND SPECIAL TOOLS

A. Spare parts shall be packed in suitable containers or boxes bearing labels clearly designating the contents and the piece of equipment for which they are intended.

B. Provide all spare parts recommended for the first year of operation.

C. At a minimum, spare parts shall include the following items:

1. Two spare filter media frame assemblies or 10% of the installed quantity, whichever is more

2. Filter panels for two complete discs or 10% of the installed quantity, whichever is more

3. One spare mixer (motor, gear reducer, shaft, and impeller) for each type of mixer provided

4. 10% spare backwash spray nozzles (if applicable)

5. One valve and actuator for each size and type of actuated backwash/sludge valve provided (if applicable)

6. Two sets of drive belts or chain for each piece of equipment with drive belt or chain.

7. Two sets of mechanical seals for each type and style of pump

8. One year's supply of lubricant for all equipment that requires routine lubrication.

9. One of each type of float switch or level sensor provided

10. Instrumentation and controls spare parts as required by instrumentation equipment manufacturers for one year of service.

11. Control Panel Spare Parts

a. One spare CPU of each type supplied.

b. One spare I/O module of each type supplied.

c. One spare specialty interface modules of each type supplied.

d. One spare remote I/O communication modules of each type supplied.

e. One spare communications module of each type supplied.

f. One spare power supply of each type supplied.

g. One spare type of each communication cable supplied.

12. Special Tools

a. Furnish one set of all special tools required for normal operation and maintenance of the equipment including one complete set of tools required for maintenance or disassembly of the system components.

b. Tools shall be furnished in a suitable steel case, clearly and indelibly marked on the exterior to indicate the equipment for which the tools are intended.

1.10 QUALITY ASSURANCE

A. Unit Responsibility: All the equipment specified in this section shall be furnished by the Seller. Seller shall be responsible for the coordination and proper function of all the equipment, as an integrated system. Seller is responsible for delivery of equipment and supplies required under these specifications. The use of word "responsible" relating to the Seller is in no way intended to relieve the Buyer (Construction Contractor) from ultimate responsibility for equipment coordination, installation, operation, and guarantee. The Buyer (Construction Contractor) shall bear ultimate responsibility for equipment coordination, installation, operation, and guarantees.

B. Shop Inspection: The Buyer and Engineer reserve the right to witness the fabrication process to monitor compliance with the specifications. The Buyer and/or Engineer may witness the progress of the System component fabrication through one or more separate shop inspections. Travel costs for shop inspections will be paid for by the Buyer.

C. Provide the services of a trained full-time employee of the Seller on the project site as the Seller's representative as required during the installation, commissioning, startup, training, and testing of the System as specified herein. The representative shall have complete knowledge of the equipment provided, including its proper installation, operation and maintenance. The representative shall be regularly engaged in overseeing equipment installations. The representative's qualifications shall be submitted to the Engineer for approval.

1.11 PERFORMANCE BOND

A. As required in Article 5 of the General Conditions and Supplementary Conditions, the Seller shall provide a Performance Bond guaranteeing that the Seller completes the obligations specified in this Section, including achieving the Performance Requirements specified in Paragraph 1.4 and the completion of the Seller's obligations under the Process Performance Guarantee specified in Paragraph 1.5.

1.12 SELLER'S SERVICE AGREEMENT

A. The Seller shall provide a Service Agreement including continuing technical and operational support on the complete Cloth Media Filtration System for two years following Substantial Completion and successful ccompletion of the Performance Test. Provide this cost as a separate item as listed in the Price Proposal form of the Request for Proposals.

B. Service Agreement shall include as needed remote support (telephone, video conference, etc.) up to 12 hours per year and two site visits in the first year following substantial completion and successful Performance Testing, and two site visits in the year thereafter. Each site visit must be no less than one (1) eight-hour day on site.

C. The Seller shall include a Service Agreement letter outlining all services included as part of the Service Agreement price. Seller shall also include service rates for remote services and on-site services, for use in a situation if additional services are needed above and beyond those included in the two-year Service Agreement.

D. This technical and operational support shall be in addition to any technical support required to resolve warranty-related systems or equipment problems.

1.13 SHIPMENT AND DELIVERY

A. Preparation for Shipment

1. Factory assemble products. Mark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with a strippable protective coating.

2. Package materials and equipment to facilitate handling and protect from damage during shipping, handling and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of Project and Seller, equipment number and approximate weight. Include complete packing lists and bills of materials with each shipment.

3. If Seller's delivery schedule and Buyer's installation schedule requires outdoor storage of the equipment prior to installation, Seller shall prepare equipment for storage outdoors in a suitable fashion based on the expected storage duration by the Buyer's installation schedule.

B. Delivery and Inspection

1. Deliver products in accordance with the requirements of the Buyer to avoid conflict with the construction work.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. The Cloth Media Filtration System shall be designed and provided by the Seller.

B. The Cloth Media Filtration System shall be:

1. AquaDisk by Aqua Aerobics

2. Kruger Hydrotech Discfilter by Veolia

3. or Equal

2.2 SCOPE OF SUPPLY

A. The scope of supply for the Seller is summarized in the following table. During the bid for the Construction Contract, the Construction Contractor shall confirm the exact scope of supply and services directly with the Seller to coordinate responsibilities between the Buyer and Seller.

DESCRIPTION	FURNISHED BY[1]
Rapid Mix Tank Mixer	Seller

Flocculation Tank Mixers	Seller
Concrete Rapid Mix, Coagulation, and Flocculation Tanks	Buyer
Disc filters	Seller
Backwash Cleaning System including pumps, valves, nozzles, and piping internal to Filter.	Seller
Filter backwash piping external to the Filter (outside of steel tank)	Buyer
Chemical Cleaning System if applicable	Seller
Heated room to support and enclose the Cloth Media Filters and related piping and flow control equipment.	Buyer
Cloth Media Filter influent gates or isolation valves	Buyer
Cloth Media Filter weirs including effluent, bypass, and influent (if required)	Seller
pH Adjustment System	Buyer
Cloth Media Filter Control Panels (CMFCP) including VFDs for cloth media filter equipment	Seller
Motor Control Center including VFDs for mixers	Buyer
Filter Building Control Panel (FBCP) including controls for chemical metering systems and mixers	Buyer
Wiring and conduit between Cloth Media Filter Control Panels (CMFCPs), Filter Building Control Panel (FBCP), and equipment furnished by the Cloth Media Filtration System Manufacturer that is not factory wired.	Buyer
Chemical bulk storage tanks and chemical dosing equipment including chemical feed pumps for coagulant, polymer, and pH adjustment.	Buyer
Piping, fittings, manual valves, and pipe supports to/from equipment furnished under this Section except where indicated otherwise.	Buyer
All Cloth Media Filter instrumentation	Seller
Notes: 1. "Seller" indicates items that shall be furnished by the Cloth Media Filter System supplier. "Buyer" indicates that the Construction Contractor shall furnish and install the indicated item.	

2.3 GENERAL REQUIREMENTS

A. Section 2.3 is intended to give a general description of what is required, but does not cover all details which may vary in accordance with the exact requirements of the equipment as offered. Any additional auxiliary equipment or materials necessary for

the proper operation of the proposed installation not mentioned in this Section, or shown on the Drawings, shall be furnished and installed at no additional cost to the Buyer. All items shall be designed for continuous operation 24 hr per day, 365 day per year, with a 30 year service. All equipment shall be designed and proportioned to have more than adequate strength, stability and stiffness to withstand all forces and stresses resulting from fabrication, shipment, erection, and operation, and to be especially adapted for the intended service.

B. The Cloth Media Filtration System shall be sized to provide a maximum hydraulic loading rate between 4.50 gpm/sf and 6.56 gpm/sf at the flow conditions specified.

C. Nameplates: Each major component of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment. Each piece of equipment shall bear the approval designation and the markings required for that designation. Valves shall be marked in accordance with MSS SP-25 and shall bear a securely attached permanent tag with the valve tag number, and normal operation position permanently displayed.

D. Equipment Guards: Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts so located that any person may come in close proximity thereto, shall be enclosed or guarded to prevent accidental personal injury, in accordance (at a minimum) with 29 CFR 1910, Subpart O, Machinery and Machine Guarding. Guards shall be designed by the Seller to meet all applicable codes. Guards shall be removable and arranged to allow access to the equipment for maintenance.

E. Process Connections: Process connections shall use Class 150 (or Class 125 for Cast/Ductile iron) flanged connections in accordance with ASME B31.1. Connections less than 1.5-inch shall be Class 150 flange, Class 125 for Cast Iron, or NPT, unless otherwise indicated. Flanges may be integral or slip-on. As an alternative, greater than ½" thick stainless steel flange rings with ANSI B16.5 hole pattern may be used, or loose flanges made from ¾" thick galvanized plate with ANSI B16.5 hole pattern may be used.

F. Painting and Finishing: Manufactured goods such as pump bodies and mixers shall be factory primed and finished coated in accordance with the manufacturer's standard minimum two coat epoxy finish systems.

G. Electrical Motors shall meet the following specifications, unless otherwise noted or approved:

1. Motors 0.5 HP or larger shall be rated for 480 VAC, 60 Hz, 3-phase service.

2. Premium efficiency, totally-enclosed fan cooled (TEFC), minimum service factor of 1.15 when operated without a variable frequency drive and 1.0 when operated with a variable frequency drive, with class F insulation operating under full load at a class B temperature in a 40 degree C ambient environment and, when the driven device is specified for variable speed operation, rated for inverter duty.

3. Suitable for use with variable frequency drives (VFDs) with a minimum 10:1 turndown operation where the driven device is specified for variable speed operation.

4. Mixer Motors to be installed outdoors shall be suitable for exterior installations in New England and be equipped with an internal condensate heater rated for operation on a 120 volt, single phase, 60 Hz power source.

5. The maximum motor speed shall be 1800 rpm, with the exception of the backwash pump, which may be up to 3600 rpm.

6. All motors shall be designed, constructed, and tested in accordance with applicable IEEE, NEA, and ANSI standards.

7. Acceptable manufacturers include U.S. Motor, Baldor, Grundfos, SEW, or equal.

H. Design mechanical components, systems, and their attachments in accordance with Section 11000. Anchor bolts shall be in accordance with Section 11000. The Seller shall be responsible for providing design and sizing of anchor bolts associated with equipment provided under their scope of supply.

I. Safety – The Cloth Media Filtration System must be safe to operate and must not pose any public health or safety hazards to the community. All equipment must be designed to OSHA standards for operator safety.

J. Reliability (Process and Equipment Reliability) - The equipment provided must perform reliably and evidence must be provided, upon request when evaluating bidders, to demonstrate that the system can recover quickly enough from system upsets to ensure continuous permit compliance for both phosphorus and other parameters.

K. Hydraulic Profile - Gravity flow through the Cloth Media Filtration System is required. Seller shall design the Cloth Media Filters to minimize hydraulic losses.

L. All major components of the system shall be factory assembled and tested and shall be shipped in as large an assembly as practical to minimize field assembling effort.

M. Electrolysis Isolators: All dissimilar metals shall be isolated over their full length with 1/8 inch thick neoprene unless otherwise noted.

N. All metal components in contact with treated wastewater or within 2 feet above the treated wastewater flow shall be Type 304 stainless steel or Type 316 stainless steel, according to the package options presented.

O. Provide all Seller piping permanently labeled with the fluid type and direction of flow. Labels shall correspond to ANSI standards unless otherwise approved. Pipe labeling will be the responsibility of the general contractor.

Add. #1

2.4 CLOTH MEDIA FILTERS

A. General

1. All fabricated metal shall be AISI 304 or 316 stainless steel depending on the tank option presented. All welding shall conform to the latest standards of the American Welding Society of ISO 3834.

2. During filtration, the filter unit shall operate in a static condition with no moving parts. The filter shall remain in service during backwashing.

3. The operator shall be able to bring a drained filter online simply by opening the influent isolation device (provided by Buyer). If the filter design is such that it must be filled with water before the influent isolation device is opened to prevent

damage to the filter media, an automated process that sequentially brings the filter back online with a single switch shall be provided. The automated process shall include a motorized valve to fill the filter with effluent or other clean water source in not more than five minutes, verify that the filter is full, and open the motorized influent isolation device.

B. Stainless Steel Filter Tank Bid Option for Type 316 Stainless Steel

1. Each Cloth Media Filter shall be designed and fabricated in a factory fabricated 316 SS tank and the entire Cloth Media Filter shall be pre-assembled and tested at the factory.

2. Entire tank construction shall have a minimum thickness of 1/8".

C. Stainless Steel Filter Tank Bid Option for Type 304 Stainless Steel

1. Each Cloth Media Filter shall be designed and fabricated in a factory fabricated 304 SS tank and the entire Cloth Media Filter shall be pre-assembled and tested at the factory.

2. Entire tank construction shall have a minimum thickness of 1/8".

D. Center Drum

1. The center drum shall be a water tight, one piece, structural welded, AISI 316 or 304 stainless steel fabrication depending on the tank option presented, open at one end and have openings to the filter discs. If the center drum design includes lubricated bearings, the bearings must be externally accessible for routine lubrication. Center drum shall be adequately sized to avoid filter bypass at effluent flows up to the peak hour flow rate.

E. Media Frame Assembly

1. The filter shall be comprised of removable round media frames. Each frame shall consist of segments that can be easily mounted or dismounted as required. Filter frames shall be constructed of modular segments.

2. Filter media shall be mounted to frame segments either by means of a filter media sock that wraps around the frame segment, or by means of filter panels consisting of filter media attached to an injection molded plastic frame. The media shall be attached to the frame segment and sealed watertight to prevent short-circuiting around the filter media. Any gasket required between filter media panels and the segment frame shall be sealed by a rubber gasket that is stretched to fit around the outer edge of the filter media panel and compressed into a groove within the segment frame. A gasket that requires the use of adhesive to hold the gasket in place during installation and removal of filter media shall <u>not</u> be accepted.

3. The filter media shall have a nominal effective pore size as recommended by the Seller to meet the effluent performance requirements (e.g., 5 – 10 microns), but in no case shall the pore size be greater than 10 microns.

4. Filter media shall be easily removed and replaced on-site without special tools.

F. Support Frame

1. The support frame shall be the Seller's standard design, such as a one piece, structural welded, AISI 316 or 304 stainless steel profiled tube construction

(depending on the tank option presented), or injection molded glass filled polypropylene frame. In all cases, provide with corrosion resistant assembly hardware. Carbon steel construction shall not be acceptable.

2. Anchor bolts shall be provided by the Buyer in accordance with Section 11000. Anchor bolt design requirements shall be provided by the Seller.

G. Filter Covers

1. For filters with a positive spray type backwash system, each filter unit shall be furnished with a cover consisting of glass fiber reinforced plastic with 316 SS hardware. The cover shall be automated to allow it to be opened and closed without the need for manual lifting. The cover shall be designed to open from either side of the filter unit to allow personnel to access the media frame segments and spray nozzles. Actuators shall meet IP69K classification for wash-down duty. Actuators shall include mechanical overload protection via integrated slip clutch and shall include a hand crank to allow for manual operation.

2. For filters with a vacuum-type backwash system, each filter unit shall be provided with a UV resistant cover including stainless steel basin mounted supports and stainless steel hardware. The cover shall be designed to contain flying insects within the filter chamber while sealed. The cover is for the purpose of filter fly containment/prevention and is not required to support the load of personnel. The cover shall be easily removable for O&M purposes and individual sections of the cover shall be less than 50 lbs to allow removal by personnel if an automated cover lifting device is not provided by the Seller. The cover shall include, at a minimum, two inspection hatches accessible from the operator platform adjacent to the filter for inspection purposes of the filter while in operation.

H. Backwash Cleaning System

1. Each Cloth Media Filter shall be equipped with the Seller's standard backwash cleaning system complete with pumps, nozzles or backwash shoe assemblies and vacuum hose (as applicable), valves, actuators, instrumentation, ancillary equipment, and all piping within the filter. Backwash system may be pressure type or vacuum type. Piping outside of filter unit will be provided by others.

2. Spent backwash water will be pumped to the splitter box upstream of the secondary clarifiers. Based on the current design configuration and layout, a total dynamic head of approximately 20-ft is anticipated (to be finalized and coordinated with selected Seller).

   a. If a pressure type backwash cleaning system is provided in which the spent backwash is discharged from the filter system by gravity, indicate the average day and max peak hour backwash flow rate (gpm) and the total anticipated average day spent backwash water (gallons). This information is needed so the Engineer can design a wet well and submersible pump station to pump the spent backwash to the splitter box upstream of the secondary clarifiers.

   b. If a vacuum-type backwash cleaning system is provided which can pump the backwash water to the desired location upstream of the secondary clarifiers, indicate the increased pump horsepower (above what would be required if the backwash water was to flow by gravity from the filter

location) required for the backwash pumps to provide the anticipated 20-ft of head to get the backwash water to the splitter box.

3. The maximum instantaneous backwash flow rate from each unit shall not exceed 5% of the peak hour forward flow rate of 4,236 gpm (6.1 MGD), which is approximately 200 gpm.

4. Filtering shall not be interrupted during normal backwashing and sludge discharge.

5. Each Cloth Media Filter unit shall have a minimum of one dedicated, centrifugal backwash pump. Backwash pump flow rate, dynamic pressure, and motor horsepower shall be selected by the Seller as required by the filter design. The pump volute shall be constructed of cast iron. The impellers, pump shaft, and impeller seal rings or seal ring retainers shall be constructed of stainless steel.

6. Each Cloth Media Filter backwash pump shall be provided with a vacuum gauge on the suction side and a pressure gauge on the pressure side. Vacuum gages are not required if the pump inlet is submerged in the filtered water.

7. If a pressure type backwash cleaning system is provided:

   a. The Cloth Media Filter shall be equipped with a single traversing back-washing system with moving spray headers for reduction of the consumption of backwash water and for efficient cleaning of the filter cloth. All panels shall receive a minimum of 95 psi pressure backwash spray.

   b. Backwash spray headers shall be 316 stainless steel backwash spray headers installed between the discs. The spray headers shall fold out for easy accessibility, requiring no disassembly and shall be operated by a cam system. The spray nozzles shall consist of ceramic nozzle tips, mounting cap for quick removal, nozzle body and seals. The nozzle system shall be Spraying Systems Co., Quick TeeJet, equivalent by Betz, or equal. The replacement of spray nozzles must be possible from outside the filter tank. A swivel joint shall allow the manifold to fold out without tools for nozzle access.

   c. Filtered water shall be discharged from the backwash pump to 316 stainless steel backwash header piping. A ball valve shall be installed in the backwash header piping downstream of the pump to manually tune nozzle pressure.

   d. Each cloth media filter shall be equipped with a backwash-collecting trough for removing solids. The trough shall be constructed of 304 or 316 stainless steel or GRP (glass reinforced plastic), depending on the tank option presented, and shall be isolated from the influent flow stream. The trough length shall be sufficient to capture sludge return from all discs along the length of the drum. The solids together with the backwash water shall leave the collecting trough by gravity via the backwash outlet connection. Piping from the trough to the outlet connection shall be 304 or 316 stainless steel, depending on the tank option presented, with stainless steel lined flexible elastomeric PVC couplings.

8. If a vacuum-type backwash cleaning system is provided:

a. All backwash control valves shall be provided as required by the filter design, including solids waste valves and backwash valves. Valves shall be three-piece, grooved end, ASTM A351 Grade CF8M stainless steel body, 316 stainless steel ball and stem, full port, installed with painted cast iron Victaulic couplings, with a 115 volt, single phase, 60 Hz, open / close service electric actuator. Valve actuator shall include a compartment heater and limit switch feedback to the microprocessor in both the open and closed positions.

b. Backwash shoes shall be UHMW. Shoe supports shall be 316 SS with end springs. The backwash shoe shall be in direct contact with the cloth.

c. Provide sludge collection manifold or trough to collect and remove solids that settle below the filter discs.

I. Drive Mechanism

1. A drive assembly shall be incorporated to rotate the center tube/media frame assembly during (and only during) backwash cycles. Systems requiring constantly rotating discs during filtration will not be acceptable.

2. The drive assembly shall consist of a gear motor and a high-strength corrosion resistant plastic or stainless-steel chain and sprocket. The gear motor shall be shaft mounted helical worm gear with integral standard AC induction motor.

3. Reducer design end rating shall equal or exceed AGMA requirements. Speed reducers shall be selected for not more than AGMA class I service.

2.5 WEIRS

A. Design, size and provide all weirs required for proper operation of the filter as specified herein including effluent weir, bypass weir, and influent weir (if required by the filter design).

B. Weirs shall be fabricated from 304 or 316 stainless steel, depending on the tank option presented. Weirs shall be sharp crested weirs, or pipe weir devices that minimize installed space.

C. The weir assemblies (sharp crested weirs or pipe weir devices) must provide adequate weir length to allow for operation of the filtration equipment throughout the specified flow ranges while minimizing the hydraulic losses and maintaining a minimum freeboard of ~~12~~ 6 inches during upset conditions.

Add. #1

D. A bypass weir shall be provided to protect the filters from damage and to prevent the filters from flooding during unexpected high inlet water flows. The bypass weir may be integral or external to the filter. The bypass weir shall be designed so that during normal operation with backwashing of the filter media, there is no contamination of the filtered effluent. If flow exceeds the specified peak hourly flow or backwashing is intentionally suspended, (both upset conditions) then the bypass weir shall divert flow to the effluent channel or pipe. The bypass weir(s) for the duty filter shall pass up to 110% of the peak hourly flow.

2.6 MIXERS

A. Mixing equipment shall include the following:

1. Rapid Mixer

a. Quantity: one duty, one standby

b. Mixing characteristic: rapid mixing to disperse coagulant

c. Mixer type: Top mount with gear box and hydrofoil impeller, or impeller recommended by the Seller and mixer manufacturer to provide optimum mixing characteristics

d. Materials of Construction: Wetted parts, including mixer shaft and impeller: 304 stainless steel

e. Drive: Variable frequency drive (by Buyer)

f. Accessories: Design for exterior installation in New England with motor heaters and gearbox oil heaters.

2. Flocculation Tank Mixers

a. Quantity: one per reaction tank, plus one standby of each type of mixer provided. Quantity of reaction tanks shall be based on Seller's design recommendations.

b. Mixing characteristic: solids suspension, coagulation, flocculation

c. Mixer type: Top mount with gear box and hydrofoil impeller, or impeller recommended by the Seller and mixer manufacturer to provide optimum mixing characteristics

d. Materials of Construction: Wetted parts, including mixer shaft and impeller: 304 stainless steel

e. Drive: Variable frequency drive (by Buyer)

f. Accessories: Design for exterior installation in New England with motor heaters and gearbox oil heaters.

B. Each mixer shall consist of a mixer gear drive, electric motor, baseplate, solid agitator shaft, mixing impellers, and controls, and be designed for wastewater containing metal hydroxide floc and polymer.

C. Mixer Gear Drive

1. The mixer gear drive shall be built in accordance with the current AGMA Standards. The AGMA calculated drive HP rating shall be stamped on the drive nameplate. Drive housings shall be of high-quality close-grained cast iron, or fabricated steel, stress relieved and reinforced, and shall be provided with lifting lugs. Each unit shall be provided with an integral or separate baseplate.

2. Gearing shall be vertical parallel shaft all helical gears or helical spiral bevel to ensure the highest efficiency coupled with the convenience of mounting and maintenance (worm gearing is not acceptable). Helical gears shall be a minimum AGMA Quality 10 per AGMA standard 390.03. Spiral/bevel sets shall be a minimum AGMA Quality 8, matched and lapped. The gears shall be grease-lubricated or lubricated from a common oil bath. Mixers with gears lubricated from a common oil bath shall be supplied with a minimum 12" pedestal base for ease of assembly of the agitator shaft and to facilitate draining of the oil from the

gear drive. The full load operating noise levels of the mixer drives shall not exceed 85 dBA at 3 feet from any part of the drive assembly.

3. The mixer gear drive shall be designed with an output shaft system suitable for the loadings imposed by the specific duty. The drive's minimum AGMA service factor shall be 1.5 and based upon motor nameplate horsepower. The service factor shall be based on AGMA Standard 6010-F97 for 24 hour per day moderate shock application. Service factors based on uniform load and motor bhp will not be accepted.

4. All drive bearings shall be of the antifriction type, ball or roller bearings. All bearings within the drive, including output shaft bearings, shall have minimum AFBMA B-10 lives of 50,000 hours when operating at full motor nameplate horsepower at design speed.

5. Each drive shall have an effective lubrication of rotating elements without leakage down the output shaft. Output shaft bearings may be grease lubricated. Output shaft bearing seals shall be dry-well type.

D. Mixer Shaft and Impeller

1. The shaft shall be designed such that the combined (Mohrs circle) maximum shear stress shall not exceed 9,000 psi under maximum operating loads for stainless steel. It shall be of overhung design for use in complete coverage (liquid levels at least one impeller diameter above the impeller height). The use of underwater steady bearings is not permitted. The mixer shaft shall have a maximum operating speed of 0.75 times the natural frequency of the shaft and impeller assembly without the use of stabilizing ring and lower shaft bearing.

2. Mixing impellers shall be of bolted construction and shall be connected to the agitator shaft with a hook key for maximum security. The maximum stress in any impeller component shall not exceed 11,000 psi under maximum operating loads.

E. Manufacturers: UET, Philadelphia, Lightnin, Chemineer, Hayward Gordon, or equal.

2.7 CHEMICAL CLEANING REQUIREMENTS

A. Provide provisions for chemically cleaning the filter.

1. At a minimum, this shall include provisions to manually add chemical cleaning solutions to the filter, pumping with valves and piping to circulate or otherwise apply the cleaning solution to the filter media and other surfaces required, and provisions to drain the chemical solution from the filter and return the solution with the backwash water to the head of the plant so that the chemical does not appear in the plant effluent.

2. If chemical cleaning is recommended by the manufacturer more frequently than once per operating season, a pressure type backwash system is used, or if the filter media is not fully submerged, then a cleaning solution spray header shall be built into the cloth media filter and a mobile Automatic Cleaning System (ACS) shall be provided by the manufacturer as specified in the following paragraph 2.7.B.

3. The Cloth Media Filter supplier shall certify that the proposed chemical solution(s) proposed for use to chemically clean the system shall not degrade,

attack or in any other way harm or reduce the service life of the materials of construction of the Cloth Media Filtration system.

B. Automatic Cleaning System

1. The ACS shall be designed to provide automatic operation and control of chemical cleaning after operator setup and initiation.

2. The ACS shall include one single stage centrifugal pump with chemical resistant magnetic drive system. The pump shall be powered via a receptacle in the CMFCP. The pump discharge shall be connected to the cleaning solution spray header via a quick connect hose. After the ACS has been manually connected by the operator, chemical cleaning of the filter shall be initiated by the operator at the CMFCP. Once chemical cleaning has been initiated, the CMFCP shall provide automatic operation and control of the chemical cleaning process.

3. A cleaning solution day tank shall be mounted securely to the skid and shall be a minimum 50-gallon polyethylene tank.

4. Each Cloth Media Filter shall be provided with a cleaning solution spray header constructed of Schedule 80 PVC or 2205 grade Stainless Steel. Spray nozzles shall be installed into the header so the cleaning solution is applied uniformly to both sides of each installed disc.

5. All components of the chemical cleaning system and cloth media filtration system that can potentially get in contact with the cleaning solution shall be compatible with the chemical solution(s) proposed for use by the Cloth Media Filter supplier. The Cloth Media Filter supplier shall certify that the proposed chemical solution(s) proposed for use to chemically clean the system shall not degrade, attack or in any other way harm or reduce the service life of the materials of construction of the Cloth Media Filtration system or cleaning system.

2.8 CONTROL SYSTEM

A. Provide a complete Control System to control and monitor the Cloth Media Filter System as specified herein. Supply all instrumentation and controls that are required to reliably operate the system in a safe manner.

B. The Control System shall include, but not be limited to, the following:

1. Individual Cloth Media Filtration System Control Panels (CMFCPs), one for each filter, to be mounted inside the Filter Building adjacent to the Cloth Media Filter.

2. Instrumentation specified in this section.

3. Control of equipment specified in this section except for mixers.

C. Each CMFCP shall be designed to power and provide all the necessary Control System functionality to operate the Cloth Media Filters.

D. Each Control Panel enclosure shall be rated NEMA 4X 304 stainless steel and sized suitably for the intended use. The completed control panel shall be UL labeled per UL508A. The completed control panel will be factory tested and configured.

E. Each CMFCP shall monitor and control the Cloth Media Filter System process in manual and automatic modes. In automatic mode, the PLC shall monitor and control

operations with setpoint adjustments and operation initiated by the operator through an operator interface terminal (OIT) on the system control panel. In manual mode, the operator shall bypass the PLC controls and control the system manually.

F. Each CMFCP shall be designed to:

1. Coordinate backwashes among cloth media filters such that only one filter is backwashing at a time.

2. Monitor filter chamber level and control filter backwash. The filter chamber level shall be monitored at a minimum by a primary analog pressure transducer and a backup digital high-level sensor (float switch or level probe). Level sensors shall be wired to the CMFCP and the level shall be monitored to control Cloth Media Filter backwash sequencing. The CMFCP shall initiate a filter backwash based on one of three conditions:

   a. Backwash time expires (operator adjustable)

   b. Primary water level sensor high setpoint is reached (operator adjustable)

   c. Backup high level sensor is activated

3. When a filter backwash is initiated, provided that a backwash permitted signal is received, the CMFCP shall control operation of the backwash pump(s) and filter drum until the backwash is complete. Filter level shall be monitored, and the backwash suspended to prevent a run dry condition of the backwash pump.

4. Monitor filter influent flow rate (flow meter signal will be sent to each CMFCP (list for clarity) using hardwired I/O or digitally over the plant SCADA system network from the FBCP or other control panel as determined by the PCSS).

5. Provide automatic operation and control of the ACS (if required) after operator connects the power receptacle and chemical hose and initiates a chemical clean at the CMFCP as specified in Paragraph 2.7.

6. Alarms shall be generated to notify operations that maintenance attention is required or an extreme condition in which the performance may be jeopardized. Provide separate lists (at OIT) for current alarms and alarm history. Coordinate with the Engineer and Buyer to prioritize alarms for remote annunciation (within the WWTP and/or offsite).

7. Coordinate with the PCSS to exchange data (via Ethernet) between Seller's PLC and Plant PLC. Data exchange includes, but is not limited to, alarms, setpoints, process values, process states, and permissives. Seller shall coordinate IP addresses with PCSS prior to connecting to the Plant Network.

8. Provide external pilot lights indicating the run and alarm status of the filter backwash pump and filter media drive unit.

9. External selector switches (Hand-Off-Automatic) for the backwash pump motor(s) and drum motor(s).

10. Control system will also allow for continuous back washing in HAND mode.

11. Display alarm and run status using panel lights and OIT displays color coded as directed by the PCSS. The following convention may change:

a. Amber Alarm

b. Red = Off, Closed

c. Green = Run, Open

G. The CMFCP shall include, but not be limited to, the following:

1. Main 480 Volt, 3 phase, 60 Hz supply with fused main disconnect (flange type, not through the door), branch circuit breakers, IEC motor starters/protectors and variable frequency drives (VFDs) for the filter equipment including drum and backwash pumps. Pressure backwashing filter shall have at a minimum a VFD for the filter drive. Vacuum backwashing systems shall have at a minimum VFDs for the backwash pumps. VFDs shall be provided with a minimum 5% line reactor and hardwired controls from the PLC.

2. To ensure compatibility with existing equipment at the plant, provide Allen-Bradley CompactLogix programmable logic controllers (PLCs) and input/output (I/O) modules, no "or equal" allowed.

3. To ensure compatibility with existing equipment at the plant, provide Allen-Bradley PanelView Plus 7 operator interface terminals (OITs) with minimum 10" diagonal screen, no "or equal" allowed.

4. Power Conditioning as follows:

a. Provide transient voltage surge suppression (SPD) on the incoming line to the CMFCP. SPD shall be heavy duty including lightning arrestors, surge capacitors and EMI/RFI noise filtering. SPD for the CMFCP shall be 480V, three phase, 3 wire (or as required to protect the main incoming panel power) and have a 100kA crest surge current rating. Units shall be provided with blown fuse indicator lights and disconnect switch. SPD shall be UL listed.

b. Provide Uninterruptible Power Supply (UPS): The UPS shall be sized by the Cloth Media Filtration System supplier to provide power to the vendor PLC, OIT, DC power supplies and all instruments connected to the CMFCP, including those not furnished by the Cloth Media Filtration System supplier. All ancillary equipment within the CMFCP (e.g., lights, power receptacles, heating, cooling) shall not be powered from the UPS. The UPS shall be double conversion online with true sine wave output providing 20 minutes of backup power at half load. The UPS shall have an internal automatic static bypass switch such that an overload condition shall transfer load to incoming line power. An external maintenance (make-before-break) bypass switch shall be installed in order to service the UPS without losing power to the control panel components. The following UPS status/alarms shall be wired to the PLC and transmitted to the SCADA system, external maintenance bypass status, static bypass status, common alarm, power failure. The UPS shall operate properly in an ambient temperature of 0 to 40 °C. The UPS shall be Sola Hevi-Duty, American Power Conversion or equal.

5. All necessary ancillary devices (managed Ethernet switches, hardware, drivers, software, etc.) needed for communication to be established from the CMFCPs to the FBCP and the plant SCADA system over the Plant's SCADA Ethernet

TCP/IP protocol based network shall be included. Any third party gateway device or configuration required to establish proper communications with the Plant Network is the responsibility of the equipment supplier, and shall be coordinated with the System Integrator.

H. PLC Hardware Requirements

1. The PLC panel shall have at a minimum 10 percent active spares of each I/O type for future use. At a minimum, active spare I/O shall include all reserved I/O. In addition, each PLC rack shall include rack space for 10 percent I/O modules for future use. Active points shall be defined as points physically configured in the PLC, all wiring between the I/O module and terminal block complete, and sufficient power supply capacity available to immediately put a point into service by connecting the field wires at the terminal block.

2. All PLC discrete and relay outputs shall be individually fused. Fused terminal blocks shall be knife disconnect type.

3. Where multiple mechanical components are provided for process redundancy, their field connections to I/O modules shall be arranged such that a failure of a single I/O module will not disable all mechanical components of the redundant system.

4. Provide sufficient I/O for the proposed system functionality. This list does not include tags that may be required to be sent over the Ethernet based plant network. At a minimum provide the following functionality:

   a. Motor starters:

      1) Monitor: Run and Fault (overload)

      2) Control: Start/Stop

   b. VFDs:

      1) Monitor: Run, Fault, and Speed (analog)

      2) Control: Start/Stop, Speed (Analog)

   c. Automated valves:

      1) Monitor: Position (Open/Closed), Remote Status, and Overload;

      2) Control: Open, Close

   d. Instrumentation: As required

I. Control Panels, Enclosures, and Cabinets

1. The following paragraphs describe general fabrication requirements of control panels, enclosures, consoles and cabinets. All control panel assemblies shall be UL listed and fabricated in accordance with National Electric Code, Article 409 – Industrial Control Panels. The Seller shall be responsible for ensuring final enclosure sizing and panel arrangements accommodate all required equipment for a fully integrated and operational system as specified herein.

2. Wiring

a. Filters within stainless steel tanks shall be furnished prewired to a NEMA 4X 304 stainless steel junction box, and all wiring of pre-assembled and mounted external electrical components to control panels or junction boxes shall be protected with rigid PVC nonmetallic Schedule 40 conduit and fittings. Conduit shall be sized for adequate spare capacity. All conduit unions and fittings shall be solvent cemented in accordance with instructions from the manufacturer. All conduits shall be supported at maximum 3-foot intervals.

b. All interconnecting wiring shall be of annealed, 98 percent conductivity, soft drawn copper and have 600-volt insulation and be rated for not less than 90 degrees Celsius.

c. Power distribution wiring on the line side of fuses shall be 12 AWG minimum. Control wiring on the secondary side of fuses shall be 16 AWG minimum. Electronic analog circuits shall utilize 18 AWG shielded, twisted pair, cable insulated for not less than 600 volts.

d. Power and low voltage DC wiring systems shall be routed in separate wireways. Crossing of power and low voltage wires shall be at right angles. Power and low voltage wires routed parallel to each other shall be separated by at least 6-inches. Wiring troughs shall not be filled to more than 60 percent visible fill. Provide separate wireways for both field and panel wiring.

e. All wiring shall terminate in a master terminal board, where each terminal is uniquely and sequentially numbered. Direct interlock wiring between equipment will not be allowed. The master terminal board shall have a minimum of 25 percent spares. Terminal blocks shall be arranged in vertical rows and separated into groups (power, AC control, DC signal). Terminal blocks shall be the compression type.

    1) Discrete inputs and outputs (DI and DO) shall have two terminals per point with adjacent terminal assignments. All active and spare points shall be wired to terminal blocks.

    2) Analog inputs/outputs (AI and AO) shall have three terminals per shielded pair connection with adjacent terminal assignments for each point. The third terminal is for shielded ground connection for cable pairs. Ground the shielded signal cable at the PLC cabinet for all analog signals that are sourced at the panel. All active and spare points shall be wired to terminal blocks. Provide surge arrestors for Analog I/O which may also serve as the I/O blocks.

    3) Terminal blocks for analog circuits shall have test terminals and bypasses for testing and troubleshooting.

    4) Wire and tube markers shall be the sleeve type with heat impressed letters and numbers.

    5) Only one side of a terminal block row shall be used for internal wiring. The field wiring side of the terminal shall not be within 6-inches of the side panel or adjacent terminal or within 12-inches of the bottom of the panel.

6) Terminal blocks shall be single-tiered and have permanent labels indicating the terminal block numbers.

f. All wiring to hand switches, etc., which are live circuits independent of the panel's normal circuit breaker protection shall be clearly identified as such.

g. All wiring shall be clearly tagged on both ends and color coded. All tag numbers and color coding shall correspond to the panel wiring diagrams and loop drawings. All power wiring, control wiring, grounding and DC wiring shall utilize different color insulation for each wiring system used. The color coding scheme shall be:

1) Incoming 120 VAC Hot - Black

2) 120 VAC Hot wiring downstream of panel circuit breaker - Red

3) 120 VAC neutral - White

4) Ground - Green

5) DC wiring - Blue

6) Foreign voltage – Yellow

7) 480 volt wiring – brown, orange, yellow for phase A, B and C conductors

3. Each field instrument shall have a separate power distribution circuit with circuit breaker or fuse with a blown fuse indication. Provide 24 VDC power supplies as required to power field instruments and panel devices.

4. Circuit power from the control cabinet out to field devices (switches, etc.,) that are used as discrete inputs to the PLC input cards shall be isolated with an isolating switch terminal block with flip cover that is supplied with a dummy fuse. Isolation switch block shall be an Allen Bradley, Square D, Phoenix Contact or equal.

5. All PLC outputs to the field shall be isolated with an isolating fuse switch terminal block with a flip cover and a neon blown fuse indicator. The single circuit fusible terminal block shall be an Allen Bradley, Square D, Phoenix Contact or equal.

6. Provide individual surge device protection for any 4-20 mA signal and 120VAC power to an instrument or equipment mounted outside of the building or facility housing. Instruments shall be housed in a grounded metallic case. Device surge protectors shall be mounted within the instrument enclosure or a separate junction box coupled to the enclosure. Provide gas tube or metal oxide varisters (MOVs) surge protection.

7. Equipment Mounting/Arrangement

a. All components shall be mounted in a manner that shall permit servicing, adjustment, testing and removal without disconnecting, moving or removing any other component. Components mounted on the inside of panels shall be mounted on removable plates and not directly to the enclosure. Mounting shall be rigid and stable unless shock mounting is

required otherwise by the manufacturer to protect equipment from vibration. Components' mounting shall be oriented in accordance with the internal components and shall be identified with suitable plastic or metal engraved tags attached with drive pins adjacent to (not on) each component identifying the component in accordance with the drawing, specifications and vendor's data.

b. All exterior panel mounted equipment shall be installed with suitable gaskets, faceplates, etc., required to maintain the NEMA rating of the panel.

c. Use ISA Recommended Practice RP60.3 as a guide in layout and arrangement of panels and panel mounted components.

8. Nameplates

a. All panels and panel devices shall be supplied with suitable nameplates, which identify the panel and individual devices as required. Each device nameplate shall include up to three lines with the first line containing the device tag number, the second line containing a functional description (e.g., Module No. 1), and the third line containing a functional control description (e.g., Start).

b. Nameplates shall be 3/32 inch thick, black and white, Lamacoid with engraved inscriptions. The letters shall be black against a white background. Edges of the nameplates shall be beveled and smooth. Nameplates with chipped or rough edges will not be acceptable. Nameplates shall be affixed to the panels using 4-40 thread stainless steel button head hex screws.

9. Control Panels or Computer Consoles

a. Control panels and computer consoles shall be of NEMA Type 4X stainless steel construction and shall be labeled by Underwriters Laboratories. The panels shall be constructed of 12 gauge thick 304 stainless steel, suitably braced internally for structural rigidity and strength. All exposed welds, seams, or edges shall be ground smooth. Front panels or panels containing instruments shall be reinforced to prevent warping or distortion.

b. Panels shall be provided with front access doors only as shown on the panel details. Front access doors with mounted instruments, control devices or operating interface terminals shall be of sufficient width to permit door opening without interference from flush mounted instruments or terminals. All doors shall be mounted with strong, continuous, stainless steel piano type hinges and be provided with lockable door handles and three point latches.

c. Provide overhead switched lighting in each panel.

d. The panel shall be suitable for top or bottom conduit entry as approved by the Engineer. For top mounted conduit entry, the panel top shall be provided with nominal one-foot square conduit entry area which may be drilled to accommodate conduit and cable penetrations. All conduit and cable penetrations shall be provided with ground bushings, hubs, gasketed

locknuts, or other accessories as required maintaining the NEMA rating of the panel and electrical rating of the conduit system.

e. Low voltage (less than 120 VAC or DC) digital or 4-20 mA DC analog control devices and circuits or PLC components shall be compartmentalized with full height isolation barriers between the low voltage and 480 volt power devices within the panel.

10. Additional heating, cooling, dehumidifying, and filtering devices shall be incorporated in control panels, enclosures, and cabinets as required maintaining internal ambient conditions within the equipment's environmental operating range without violating the cabinet's NEMA rating. Minimum cabinet temperature shall not drop below 45 degrees Fahrenheit or exceed 104 degrees Fahrenheit under any conditions that have a UPS located in that cabinet.

11. Each control enclosure assembly shall be provided with corrosion inhibitors to protect interior electrical components from damage caused by high humidity. The corrosion inhibitors shall be installed prior to shipment to provide protection during shipment and storage of the enclosure. The corrosion inhibitor shall contain a chemical combination that vaporizes and condenses on all surfaces in an enclosed area. Vapors shall redeposit as needed in the event of condensation of moisture on surfaces. These vapors shall reach every part on the enclosure, protecting all interior surfaces. The emitters shall have additional red-metal inhibitors. Enclosures shall be reasonably sealed.

J. Managed Ethernet Switches

1. Ethernet switch(s) shall be a managed switch. The switch shall have the following physical features:

a. Copper ports: 10/100 TX RJ45 ports, minimum 2 spare ports

b. Operating temperature: -10°C to 70°C

c. Power: 24 VDC redundant power supply inputs

d. Enclosure: DIN-rail mountable

2. The switch shall have the following features:

a. Full duplex on all port

b. Auto negotiation and manual configurable speed and duplex

c. Wire speed switching fabric

d. IEEE 802.1w RSTP

e. IGMP snooping

f. IGMP filtering

g. Configuration password protected

h. Configuration backup capability required

i. SNMP V3

j. Lock port function for blocking unauthorized access based on MAC address.

3. The switch shall have the following additional features

a. The converter shall come equipped with a dry contact rated for 120 VAC 5A that shall be used for common trouble alarm. The alarm shall be programmable. If the contact cannot use 120 VAC 5A, provide the necessary 24 VDC power from the PLC panel and provide interposing relays in the PLC panel.

4. Switches installed in the plant network shall match manufacturer and series of plant switches provided elsewhere in this project.

5. Acceptable Manufacturers

1) Moxa

2) N-Tron

3) Allen-Bradley

4) Or equal

2.9 INSTRUMENTATION

A. General

1. Seller shall provide all instrumentation required for the proper functioning of the Cloth Media Filtration System as specified herein and as required by the Seller's Sequence of Operation.

2. At a minimum, instrumentation shall include primary and backup water level measurement for backwash initiation, and pressure gauges for backwash pump monitoring as specified. If any additional instrumentation is recommended by the manufacturer for protection, monitoring, or control of the filtration equipment including filter control panels and backwash pumps, it shall be provided by the Seller.

3. Separate instrumentation shall be provided for each filter.

4. Other instrumentation for the purpose of process monitoring and optimization including pH sensors, turbidimeters, and flow meters, if required, will be provided by the Buyer.

B. Pressure Transducer:

1. A minimum of one submersible or flush mounted pressure transducer shall be supplied for each filter basin for primary filter chamber level monitoring. Additional pressure transducers shall be provided as recommended by the Seller.

2. The transmitter shall provide a 4 to 20 mA DC output signal. Accuracy shall be ±0.25%. Pressure transducer shall be manufactured by ifm efector, inc., Pressure Systems, Inc., Endress-Hauser, Siemens, Rosemount, Foxboro, or equal.

C. Digital Level Sensors

1. A minimum of one digital level sensor shall be supplied for each filter basin for backup filter chamber high level alarm.

2. Digital level sensors shall be either level probes or float switches. Level sensors shall be suitable for the intended application as recommended by the Seller.

D. Vacuum/Pressure Gauges

1. Gauges shall be 4½ inch diameter minimum, black FRP case, glycerin filled, acrylic lens, screwed lens ring, solid front, blow-out back, bronze bourbon tube, ½ inch NPT brass socket, bottom connection, stainless steel brushed movement, 1% accuracy full scale, ANSI B 40.1 grade 1A.

2. Select the proper range for the service intended. Provide gauges that are capable of displaying both a vacuum and a pressure condition if both conditions could exist in the system.

3. Provide a brass snubber, brass shut off ball valve, and cleanout design type diaphragm protection seal.

PART 3 EXECUTION

3.1 GENERAL

A. Seller shall deliver all Cloth Media Filtration System equipment to the project site where and when directed to by the Buyer.

B. Buyer shall unload and thoroughly inspect Goods upon arrival at the project site and report observed damage immediately to the Seller and Engineer in writing. Seller shall repair to as-new condition or replace damaged equipment. Any repair work shall be approved by the Engineer and performed by a factory-trained technician associated with the Seller.

C. Seller shall provide a representative to attend a minimum of two pre-installation meetings with the Buyer and Engineer to review general procedures, erection and installation instructions, and installation sequence. This shall include coordinating Control System connections with the plant's SCADA system.

D. Buyer shall install Goods in accordance with Seller's shop drawings, instructions and recommendations, as well as drawings and specifications for the Construction Contractor's Contract Drawings.

E. Buyer shall provide finish painting of items with a shop prime coat and touch-up painting of those areas damaged during installation.

F. Seller shall provide a representative to inspect and verify in writing that the installation of the Goods are in accordance with Seller's shop drawings, instructions and recommendations, as well as drawings and specifications for the Construction Contractor's Contract Drawings. Report deviations to the Buyer and Engineer in writing. Buyer to coordinate the schedule of this inspection with the Seller so that the inspection and needed corrective actions are completed prior to Buyer proceeding with testing activities.

G. Buyer shall provide and coordinate the on-site assistance and coordination necessary for the Seller to complete the various inspections and various testing requirements specified in this section and make adjustments, repairs, or replacements required to make the system pass all testing requirements.

H. Until such time as the installation of the Goods are complete and performance testing of the installed Goods is successfully completed, the responsibility of costs associated with operating the Goods shall be as follows:

1. Electrical Power – Buyer

2. Polymer – Buyer

3. Coagulant and Other Chemical – Buyer

4. Plant Water – Buyer

3.2 SELLER'S FIELD SERVICES AND PERFORMANCE TESTING

A. Installation, Commissioning, and Startup

1. Services of a Seller's representative who is experienced in the installation, adjustment, and operation of the specified equipment shall be provided.

2. Services of a Seller's representative shall be provided as necessary to inspect the installation, and to supervise the commissioning and startup of the System, but this shall be no less than fifteen (15) days over three separate trips. Days shall be 8-hours on-site and be exclusive of travel time.

B. Training

1. Training shall be scheduled after copies of operation and maintenance manuals specified in Section 01770 have been delivered and be scheduled at least 10 days in advance with the Buyer.

2. The Seller shall provide the services of a factory-trained representative to train the Buyer on the operation and maintenance of equipment supplied under this Section in accordance with the requirements of Section 11000.

3. Provide a minimum of 16 hours of training consisting of four sessions, each session being four hours long. Each session must be on separate days, and sessions shall not be on consecutive days.

C. Performance Testing

1. Provide services required to complete the testing as described herein.

D. Where delays are directly attributable to the Seller, the actual number of days on site shall be increased above the minimum specified as necessary, without additional cost to the Buyer, as necessary to comply with this specification. Where delays are not directly attributable to the Seller, additional days spent on site due to delays caused by Others will be paid by Others at the Seller's standard field service rate.

3.3 COMMISSIONING REQUIREMENTS

A. Commissioning Team: The commissioning team shall consist of the Engineer, Buyer and Seller personnel capable of testing and adjusting electrical, mechanical, instrumentation, and controls equipment and systems.

B. The startup testing and Performance Tests shall be aborted if any system deficiency prevents the successful completion of the test. Pre-commissioning check, and commissioning shall be aborted if a required commissioning team member is not present for the test.

C. The Buyer will be allowed to schedule the startup and commissioning of all filters within the same timeframe as this can be achieved without impacting existing plant operations. The Buyer will also be allowed to schedule performance testing of all filters within the same timeframe as long as other plant preparations are complete as specified herein.

D. Pre-Commissioning: Test and verify the installation of the Cloth Media Filtration System and ancillary systems prior to startup, using plant water for all tests requiring fluids, including that of the related chemical feed systems. Correct deficiencies discovered with Seller provided equipment during these checks and re-test until commissioning is complete. The tests shall include, but not necessarily be limited to:

1. As-built documents: verify that treatment process piping, valves and equipment are consistent with the design.

2. General: Inspect the installed Goods for proper alignment, correct operation, proper connection, and satisfactory function of all components, including ground fault circuit interrupters and a safety inspection of wet cable connectors. Approve the installation and provide a written certification that the system components have been installed correctly and are ready for operation.

3. Hydrostatic tests: Test water tightness of all tanks following assembly.

4. Rotation: Test rotation of pumps, mixers, and drums to confirm they operate in accordance with design.

5. Vibration: Operate rotating equipment and demonstrate it does not vibrate in excess of manufacturers' recommendations.

6. Instruments: Calibrate field instruments that are not factory-calibrated. Check the calibration of all instruments using process conditions where possible, or simulated conditions where operating the process would be impractical.

7. Control System: Confirm electrical continuity between field instruments, equipment, and control system and confirm inputs and outputs are correctly wired. Coordinate with the Buyer and provide loop test sheets to document that each physical signal in accordance with the P&IDs and Electrical Drawings has been correctly landed and each control loop is tested as being programmed in accordance with the requirements herein.

8. SCADA Coordination: Provide the Ethernet interface with monitoring and control functions between the Cloth Media Filter Control Panel (CMFCP) and the plant control system. Coordinate with the Plant Control System Supplier (PCSS) during the interface test.

9. Piping: Buyer to pressure test piping in accordance with requirements of the Construction Contract.

10. Electrical: Buyer to verify continuity in accordance with Division 16 – Electrical of the Buyer's Construction Contract.

E. Commissioning:

1. Demonstrate that the system and related control system operate in accordance with the specifications, including all operating, monitoring, and shutdown functions and remote "call in" alarm functionality is operable.

2. If, in the opinion of the Engineer, the commissioning tests do not meet the requirements specified herein, performance testing will not begin until the Seller has made such adjustments, changes, and/or additions as necessary to correct the system, and demonstrated this by a satisfactory commissioning test as specified above.

3. If, in the opinion of the Engineer and the Seller's representative, the system meets the requirements specified herein, the system will advance to startup testing.

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~~3.~~4. Prior to Start-up Testing (which includes optimizing the treatment chemistry, among other testing requirements) and prior to Process Performance Testing, the Owner and Engineer shall confirm to the Seller when the inlet conditions to the disc filter system for phosphorus and TSS specified in paragraph 1.4.C have been met for a period of at least 5 days. If, in the opinion of the Engineer and the Seller's representative, the influent to the system meets the requirements specified herein, the system will advance to Start-up Testing.

F. Startup Testing:

1. The startup testing shall be aborted if any system deficiency prevents the successful completion of the test.

2. Startup the Cloth Media Filtration System following successful completion of the pre-commissioning and commissioning tests. Furthermore, the startup of the Cloth Media Filtration System shall not occur until after the substantial completion of all ancillary items and upstream and downstream processes required to operate the Cloth Media Filtration System and those items needed to meet the filter influent limitations specified in Paragraph 1.4.

3. The Startup Testing period shall last a minimum of five days and the Startup Testing period shall end only after the tests listed below have been completed for each train followed by three consecutive days of alarm-free operation.

4. During the Startup Testing period, the Seller's representatives shall test each cloth media filter to confirm that it operates in accordance with the design requirements and shall adjust the chemical dosages as required. The Seller shall be responsible for all process tests and operational adjustments during the Startup Testing period. During Startup Testing, the following tests shall be performed:

   a. Confirm alarms are initiated by alarm conditions, are annunciated correctly, and terminated in accordance with the design requirements.

   b. Test process control loops to confirm correct response of process equipment to changing conditions.

   c. Test safety and alarm handling sequences.

   d. Confirm chemical feed equipment provided by Buyer performs in accordance with Seller's recommendations.

   e. Test manual operations.

   f. Test setpoint adjustments.

   g. Optimize the treatment chemistry.

h. Demonstrate that the system can pass the Peak Hourly Flow Rate as specified in Paragraph 1.4.B and 1.4.C.

3.4 PROCESS PERFORMANCE TESTING

A. Submit proposed Process Performance Test Procedures, which at a minimum shall address the following:

1. Seller's representative on-site during all weekdays during performance test periods.

2. Operate each filter for similar lengths of time and tests during the testing period.

3. Provide guidance on methods for simulating conditions to approximate operations at the various specified design conditions including closing off filters to increase the hydraulic and solids loading rates. Seller shall be responsible for closing off filters during testing.

4. Confirm that the effluent quality is satisfactory under the specified worst-case design conditions, i.e., peak flow, minimum chemical dose, the highest influent phosphorus concentration, and the highest influent suspended solids. The intent is to demonstrate the system's performance under worst-case influent conditions while minimizing the chemical dosages required to meet the required effluent. The intent is not to test multiple chemical dosages at varying influent conditions. This shall include, if necessary:

a. Propose measures such as spiking the influent with solids to simulate the design influent conditions as closely as possible.

b. Propose for the Buyer to reduce the multipoint coagulant dosing (prior to the Cloth Media Filtration System) to increase phosphorus loading to the filters.

B. Process Performance Testing shall include Intensive Effluent Quality Testing (per Paragraph 3.4.E) and Operation & Maintenance Guarantee Testing (per Paragraph 3.4.F) conducted at the same time. A Seller's representative shall supervise the performance testing, analyze data, and certify the system's performance during the testing. Tests shall be documented during continuous operation of the system, and the Seller shall submit to the Engineer a complete report containing all data, calculations, lab report sheets, and a description of the performance testing procedures and results for review.

C. The guaranteed effluent quality shall only be considered to be achieved when both the Intensive Effluent Quality Test and Operation & Maintenance Guarantee Testing demonstrate that the system meets the performance requirements of this specification.

D. Performance test shall start at least thirty days after the completion of Startup Testing. This test shall include at minimum:

1. Provide a 20-business day testing period overall (inclusive of times shown in following paragraphs)

2. Provide 4 days of Stress Testing the filters.

a. This shall include testing each filter separately for at least four hours as well as testing both filters running in parallel for at least four hours.

b. During stress testing, the Seller may blind off (remove) cloth filter discs to achieve equivalent required hydraulic and solids loading rates.

c. Provide a minimum of two hours per filter of stress testing with MLSS spiking. Buyer shall increase the solids loading rate up to the maximum day solids loading rate (approximately 1,600 lbs/day TSS per filter based on maximum influent solids concentration (30 mg/L) and design peak hour flow rate (6.1 mgd) assuming 5% recycle per filter) by introducing solids from the aeration tanks directly into the rapid mix tank, or the Seller may elect to blind off (remove) cloth filter discs to achieve the equivalent solids loading rate, if applicable. The Buyer shall provide a sump pump, control valves, and temporary hose to supply the required pounds of solids from the aeration tanks, if this method is used. The mixed liquor concentration in the aeration tanks typically ranges from 5,300 to 6,300 mg/L. During the testing with MLSS spiking, the Seller will not have to demonstrate the Operational Maintenance Guarantee and the Buyer/Owner will only operate the plant so that that the soluble ortho-phosphorus entering the system is less than 1.0 mg/L. This is because the particulate phosphorus associated with the MLSS spike may cause the total phosphorus entering the system to be higher.

d. During Stress Testing with high flows, collect a minimum of 3 grab samples per filter per test distributed evenly throughout the duration of the test. In addition, collect one influent grab sample (prior to coagulant addition).

e. During Stress Testing with MLSS spiking, collect a minimum of 3 grab samples per filter per test distributed evenly throughout the duration of the test. In addition, collect one influent grab sample (prior to coagulant addition). Influent grab sample shall confirm the maximum day solids loading rate of 1,600 mg/L is not exceeded, prior to conducting the stress testing with MLSS spiking. Conduct the stress testing with MLSS spiking if the influent is compliant with respect to the max solids loading rate.

f. During the four days of Stress Testing, the filters shall be returned to normal configuration (one duty filter, no MLSS spiking, and no recirculation) outside of normal business hours.

g. During Stress Testing, 24-hour time based composite samples will be required.

3. Provide a minimum of 5 days of Routine Testing per filter as follows:

a. During Routine Testing, operate one filter at a time, during which all plant flow will be discharged to the filter. If the WWTP flow rate exceeds the equivalent Maximum Day Flow Rate, then the Seller may disregard the data for that day if it does not meet the specified performance requirements.

b. During Routine Testing, 24-hour time based composite samples will be required, as well as a minimum of 3 grab samples per day for process control.

E. Intensive Effluent Quality Testing:

1. Performance Testing of the System must demonstrate the ability to comply with the process performance requirements described in Section 1.4.

2. During each day of the Performance Test, the Seller shall operate the System to achieve the effluent requirements delineated in Section 1.4.D. During this testing, the Operation and Maintenance parameters guaranteed in the Seller's Bid (including those for coagulant dose rate and polymer dose rate) shall be measured, recorded, and to the extent possible, maintained below the guaranteed level.

3. During each day of the testing, the Buyer will collect daily, 24-hour composite samples from the System influent (prior to coagulant addition) and effluent for analysis.

4. During each day of the testing, Seller shall collect and analyze a minimum of two sets of grab samples from the influent (prior to coagulant addition) and effluent of the combined flow from all operating filters unless otherwise noted (i.e. two separate influent grab samples and two separate effluent grab samples). At the time when the samples are collected, log the time, pH, chemical dose rates, polymer dose rates, and effluent flow rates.

5. Laboratory/Analytical Requirements:

    a. Seller shall pay for all laboratory analyses necessary to complete the performance testing. This includes retesting if required.

    b. All laboratory analyses necessary to complete the performance testing shall be conducted by an independent, third-party laboratory approved by the Buyer and certified by the Commonwealth of Massachusetts in accordance with "Standard Methods for the Examination of Water and Wastewater," latest edition.

    c. The minimum detection limits for parameters shall be as follows:

        1) Phosphorus (all) 0.01 mg/l

        2) Aluminum 0.05 mg/l

        3) Iron 0.04 mg/l

    d. Buyer reserves the right to take split samples.

    e. All 24-hour composite (influent and effluent) samples shall be analyzed for the following parameters:

        1) Total Suspended Solids (mg/L)

        2) Total Phosphorus (mg/L as P)

        3) Soluble (filterable through a 0.45 micron filter) Total Phosphorus (mg/L as P)

        4) Soluble (filterable through a 0.45 micron filter) Orthophosphate-Phosphorus (mg/L as P)

        5) Total Aluminum (µg/L as Al)

        6) Total Iron (µg/L as Fe)

7) pH

f. All grab samples (influent and effluent) shall be analyzed for the following parameters:

1) Total Suspended Solids (mg/L)

2) Total Phosphorus (mg/L as P)

3) Soluble (filterable through a 0.45 micron filter) Total Phosphorus (mg/L as P)

4) Soluble (filterable through a 0.45 micron filter) Orthophosphate-Phosphorus (mg/L as P)

6. Additional field analyses for process control purposes may be conducted by the Seller, at their discretion and at no additional cost to the Buyer. Results of the field analyses shall be made available to the Engineer and Buyer for inspection in a log sheet on a daily basis and provided as a submittal upon completion of the performance testing.

F. Operation & Maintenance Guarantee

1. Chemical (coagulant, polymer) consumption shall be measured and reported for each Routine Testing day based on the drop in storage tank levels or by other means as approved by the Engineer.

2. The actual chemical consumption during each day of Routine Testing shall be averaged and used for calculation of the actual chemical consumption for comparison with the Operation and Maintenance Guaranteed values.

3. If the average flow rate during included testing days exceeds the Design Average Daily Flow Rate, then the highest flow rate days shall be eliminated from the calculation one day at a time until the average flow rate of the included testing days is less than the Design Average Daily Flow Rate. At other times, when the average flow rate does not exceed the Design Average Daily Flow Rate, then the Operation and Maintenance Guaranteed value at the Design Average Daily Flow Rate will be used.

G. Criteria for Completion of Process Performance Testing

1. The Process Performance Tests will be considered to be successful if Intensive Effluent Quality Testing on each filter demonstrates that the effluent complies with the performance requirements specified herein when operated in a manner consistent with the Seller's Operational & Maintenance Guarantee.

2. If, in the opinion of the Engineer, the system meets the performance requirements specified herein, the Engineer will recommend, by letter, the official acceptance of the performance test and partial substantial completion of the system at the time the successful testing period was initiated. If, in the opinion of the Engineer, the performance test results do not meet the requirements specified herein, the Engineer will notify the Seller and the Buyer in writing of the unacceptable performance and amounts of payment due to Seller upon successful completion of the performance test will be withheld until the system is corrected and retesting has been completed.

H. Criteria for Resolving Unacceptable Performance Testing (Intensive Effluent Quality Testing)

1. If the Seller demonstrates to the satisfaction of the Engineer that the Performance Test is unsuccessful due to a failure in the chemical metering system or other equipment not provided by the Seller, then the data associated with those failures may be excluded from the evaluation.

2. In the case of unacceptable performance, the Seller shall then have 60 calendar days in which to perform, at the Seller's sole expense, any supplemental testing, equipment adjustment, changes or additions and to request an additional retest of the unacceptable system.

3. After making adjustments, Seller shall repeat the Intensive Effluent Quality Testing at no additional cost. Up to three attempts will be permitted. The entire test shall be repeated unless Engineer approved a shorter test based on suitable documentation provided by the Seller demonstrating cause for a short test. Shorter testing periods will only be approved if the performance test results will document a total of four (4) periods with each period made up of seven (7) consecutive days of acceptable performance.

4. Should the System fail to meet the required operating conditions after the necessary corrective measures are implemented, then the Seller's shall comply with the requirements specified in the Seller's Performance Guarantee in Paragraph 1.5 of this Section.

END OF SECTION

Attachments follow this Page

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Attachment C to Section 11365

Total Copper Sample Results

Spencer WWTP Total Copper Sample Results				
Date	Influent	Influent	Secondary Effluent	Secondary Effluent
	CU	CU	CU	CU
	UG/L	LBS	UG/L	LBS
TOTAL	31	32	32	32
MEAN	287	2	8	0
MEDIAN	91	1	7	0
MAX MONTH	401	2	14	0
MIN	10	0	4	0
MAX	4510	24	17	0
1/2/2018	167	1	17	0
2/7/2018	39	0	7	0
3/7/2018	28	0	6	0
4/4/2018	31	0	7	0
5/2/2018	10	0	7	0
6/7/2018	146	1	7	0
7/4/2018	74	0	9	0
8/1/2018	455	2	7	0
10/3/2018	84	1	6	0
11/7/2018	48	1	11	0
12/5/2018	113	1	7	0
1/2/2019	49	1	4	0
2/6/2019	696	6	7	0
3/6/2019	50	0	9	0
4/3/2019	36	0	8	0
5/1/2019	86	1	7	0
6/5/2019	204	1	6	0
7/2/2019	301	2	14	0
8/28/2019	136	1	14	0
9/4/2019	238	1	5	0
10/2/2019	270	1	8	0
11/11/2019	91	1	6	0
12/2/2019	43	0	8	0
1/1/2020	34	0	7	0
2/5/2020	61	0	11	0
3/4/2020	58	0	7	0
4/1/2020	141	2	8	0
5/4/2020	204	2	16	0
6/1/2020	158	1	8	0
7/6/2020	347	2	8	0
8/3/2020	125	1	14	0